Standard ECMA-192
2nd Edition - December 1994

ECMA

Standardizing Information and Communication Systems

# Private Telecommunication Networks (PTN) - Inter-Exchange Signalling Protocol - Call Offer Supplementary Service

**Phone:** +41 22 849.60.00 - **Fax:** +41 22 849.60.01 - **X.400:** C=ch; A=arcom, P=ecma, O=genevanet, OU1=ecma, S=helpdesk - **Internet:** Helpdesk@ECMA.CH

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**(QSIG-CO)**

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## Brief History

This Standard is one of a series of ECMA standards defining services and signalling protocols applicable to Private Telecommunication Networks (PTNs). The series uses the ISDN concepts as developed by the ITU-T and is also within the framework of standards for open systems interconnection as defined by ISO. It has been produced under ETSI IMCC work item DE/ECMA-00052.

This Standard specifies the signalling protocol for use at the Q reference point in support of the Call Offer supplementary service.

The 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 JTC1, ITU-T, ETSI and other international and national standardization bodies. It represents a pragmatic and widely based consensus.

Compared to the 1st Edition of Standard ECMA-192 (published by ECMA in June 1993), various changes have been made in order to achieve alignment with ETS 300 362 (which is based on the 1st Edition of ECMA-192 but modified during Public Enquiry). In addition, protocol interactions with other supplementary services have been added, based on the relevant clauses of prETS 300 427 (which is based on Standard ECMA-204 but modified during Public Enquiry).

This ECMA Standard has been contributed to ISO/IEC for adoption as an International Standard.

This ECMA Standard has been adopted by the ECMA General Assembly of December 1994.

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## 1 Scope

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

SS-CO is a supplementary service which, on request from the calling user (or on that user's behalf), enables a call to be offered to a busy called user and to wait for that called user to accept this call.

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 ECMA 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 ETS 300 361.

The signalling protocol for SS-CO 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.

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

*NOTE*

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

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

## 2 Conformance

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

Conformance to this Standard includes conforming to those clauses that specify protocol interactions between SS-CO and other supplementary services and ANFs for which signalling protocols at the Q reference point are supported in accordance with the stage 3 standards concerned.

## 3 References

| | |
|---|---|
| ISO/IEC 11579-1 | Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Reference configurations for PISN exchanges (PINX) (1994) |
| ETS 300 171 | Private Telecommunication Network (PTN); Specification, functional model and information flows; Control aspects of circuit mode basic services (1992) (Standard ECMA-142) |
| ETS 300 172 | Private Telecommunication Network (PTN); Inter-exchange signalling protocol; Circuit mode basic services (1994) (Standard ECMA-143) |
| ETS 300 196 | Integrated Services Digital Network (ISDN); Generic functional protocol for the support of supplementary services Digital Subscriber Signalling System No. one (DSS1) protocol (1993) |
| ETS 300 239 | Private Telecommunication Network (PTN); Inter-exchange signalling protocol; Generic functional protocol for the support of supplementary services (1993) (Standard ECMA-165) |
| ETS 300 257 | Private Telecommunication Network (PTN); Inter-exchange signalling protocol; Diversion supplementary services (1993) (Standard ECMA-174) |
| ETS 300 261 | Private Telecommunication Network (PTN); Inter-exchange signalling protocol; Call transfer supplementary service (1993) (Standard ECMA-178) |
| ETS 300 361 | Private Telecommunication Network (PTN); Specification, functional model and information flows; Call offer supplementary service (1994) (Standard ECMA-191) |

| | |
|---|---|
| ETS 300 364 | Private Telecommunication Network (PTN); Inter-exchange signalling protocol; Do not disturb and do not disturb override supplementary services (1994) (Standard ECMA-194) |
| ETS 300 387 | Private Telecommunication Network (PTN); Method for the specification of basic and supplementary services (1994) |
| prETS 300 415 | Private Telecommunication Network (PTN); Terms and definitions (1994) |
| prETS 300 426 | Private Telecommunication Network (PTN); Inter-exchange signalling protocol; Call intrusion supplementary service (1994) (Standard ECMA-203) |
| CCITT Rec. I.112 | Vocabulary of terms for ISDNs (1988) |
| CCITT Rec. I.210 | Principles of telecommunication services supported by an ISDN and the means to describe them (1988) |
| CCITT Rec. Z.100 | Specification and description language (1988) |

## 4 Definitions

For the purpose of this ECMA Standard the following definitions apply.

### 4.1 External definitions

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

- Application Protocol Data Unit (APDU) (ETS 300 239);
- Basic Service (CCITT Rec. I.210);
- Call, Basic Call (ETS 300 239);
- Coordination Function (ETS 300 239);
- Notification (ETS 300 239);
- Originating PTNX (ETS 300 172);
- Private Telecommunication Network Exchange (prETS 300 415);
- Private Telecommunication Network (prETS 300 415);
- Public ISDN (prETS 300 415);
- Rerouteing PTNX (ETS 300 257);
- Served User (ETS 300 257);
- Signalling (CCITT Rec. I.112);
- Supplementary Service (CCITT Rec. I.210);
- Supplementary Service Control Entity (ETS 300 239);
- Terminal (prETS 300 415);
- Terminating PTNX (ETS 300 172);
- Transit PTNX (ETS 300 172);
- User (ETS 300 171).

### 4.2 Inter-PTNX link

The totality of a signalling channel and a number of user information channels at the Q reference point.

### 4.3 Path retention

The retaining of the network connection between the Originating PTNX and the Terminating PTNX so that a supplementary service (such as SS-CO) can be invoked without establishing a new connection.

### 4.4 Served User PTNX

The PTNX serving the served user.

## 5 List of acronyms

| | |
|---|---|
| ANF | Additional Network Feature |
| APDU | Application Protocol Data Unit |
| ASN.1 | Abstract Syntax Notation no. 1 |
| ISDN | Integrated Services Digital Network |

| | |
|---|---|
| NFE | Network Facility Extension |
| PICS | Protocol Implementation Conformance Statement |
| PTN | Private Telecommunication Network |
| PTNX | Private Telecommunication Network Exchange |
| SDL | Specification and Description Language |
| SS-CO | Call Offer supplementary service |

# 6 Signalling protocol for the support of SS-CO

## 6.1 SS-CO description

Call Offer (SS-CO) is a supplementary service which, on request from the calling user (or on that user's behalf), enables a call to be offered to a busy called user and to wait for that called user to accept this call.

SS-CO is applicable to all circuit mode basic services defined in ETS 300 171.

## 6.2 SS-CO operational requirements

### 6.2.1 Requirements on the Originating PTNX

Call establishment procedures for the outgoing side of an inter-PTNX link and call release procedures, as specified in ETS 300 172, shall apply.

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

### 6.2.2 Requirements on the Terminating PTNX

Call establishment procedures for the incoming side of an inter-PTNX link and call release procedures, as specified in ETS 300 172, shall apply.

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 Transit PTNX

Basic call procedures specified in ETS 300 172 for a Transit PTNX shall apply.

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

For SS-CO 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-CO coding requirements

#### 6.3.1 Operations

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

**Table 1 - Operations in support of SS-CO**

```
Call-Offer-Operations
                    {iso(1) identified-organization(3) icd-ecma(0012) standard(0)
                    qsig-call-offer(192) call-offer-operations (0) }

DEFINITIONS EXPLICIT TAGS ::=

BEGIN

IMPORTS             OPERATION, ERROR FROM Remote-Operation-Notation
                        {joint-iso-ccitt(2) remote-operations(4) notation(0)}
                    Extension FROM ECMA-manufacturer-specific-service-extension-definition
                        {iso(1) identified-organization(3) icd-ecma(0012) standard(0)
                        qsig-generic-procedures(165) msi-definition(0)}
                    notAvailable, supplementaryServiceInteractionNotAllowed FROM General-Errors
                        {ccitt(0) identified-organization(3) etsi (0) 196 general-errors (2)};

ptn OBJECT IDENTIFIER
                    ::=  { iso(1) identified-organization(3) icd-ecma(0012)
                    private-isdn-signalling-domain (9)}

PathRetain          ::=  OPERATION
                         ARGUMENT       PathRetainArg
                         -- this operation may be used by other supplementary services
                         -- using other values of argument

ServiceAvailable    ::=  OPERATION
                         ARGUMENT       ServiceAvailableArg
                         -- this operation may be used by other supplementary services
                         -- using other values of argument

CallOfferRequest    ::=  OPERATION
                             ARGUMENT       DummyArg
                             RESULT         DummyRes
                             ERRORS     { notAvailable, notBusy, temporarilyUnavailable,
                                 supplementaryServiceInteractionNotAllowed, unspecified}

PathRetainArg       ::=  CHOICE     {serviceList ServiceList,
                                     extendedServiceList SEQUENCE{
                                         serviceList ServiceList,
                                         extension Extension
                                             }
                                     }
```

```
ServiceAvailableArg     ::=     CHOICE      {serviceList ServiceList,
                                            extendedServiceList SEQUENCE{
                                                serviceList ServiceList,
                                                extension Extension
                                                        }
                                            }

ServiceList             ::=     BIT STRING {callOffer(0)} (SIZE(1..32))
                        -- bits other than callOffer(0) are reserved for
                        -- other supplementary services

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

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

CfbOverride             ::=     OPERATION
                                ARGUMENT DummyArg
                                – used in the interaction with Call Forwarding Busy


callOfferRequest        CallOfferRequest    ::= {ptn co-request(34)}
pathRetain              PathRetain          ::= {ptn path-retain(41)}
serviceAvailable        ServiceAvailable    ::= {ptn service-available(42)}
cfbOverride             CfbOverride         ::= {ptn cfb-override(49)}
notBusy                 ERROR       ::= {ptn 1009}
                        -- used when an SS-CO request is received in
                        -- a Terminating PTNX and the called user is not busy

temporarilyUnavailable  ERROR       ::={ptn 1000}
                        -- used when conditions for invocation of SS-CO
                        -- are momentarily not met

Unspecified             ::=     ERROR PARAMETER Extension

unspecified             Unspecified ::= {ptn 1008}

END                     -- of Call-Offer-Operations
```

### 6.3.2 Notifications

The notification defined in Abstract Syntax Notation number 1(ASN.1) in table 2 shall apply.

**Table 2 - Notification in support of SS-CO**

```
Call-Offer-Notifications
                                    {iso(1) identified-organization(3) icd-ecma(0012) standard(0)
                                    qsig-call-offer(192) call-offer-notifications(1)}

DEFINITIONS                 ::=
BEGIN

IMPORTS                             NOTIFICATION FROM Notification-Data-Structure
                                    {iso(1) identified-organization(3) icd-ecma(0012) standard(0)
                                    qsig-generic-procedures(165) notification-data-structure(7)};

RemoteUserAlerting          ::=     NOTIFICATION
                                        ARGUMENT            NULL

remoteUserAlerting          RemoteUserAlerting      ::=
                                    {iso(1) identified-organization(3) icd-ecma(0012)
                                    private-isdn-signalling-domain(9) 2000}

END                                 --of Call-Offer-Notifications
```

### 6.3.3 Information elements

#### 6.3.3.1 Facility information element

The operations defined above shall be coded in the Facility information element in accordance with ETS 300 239.

When conveying an APDU of operation callOfferRequest, the NFE shall be included.

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

When conveying the invoke APDU of operation callOfferRequest, the Interpretation APDU shall be omitted.

*NOTE*

*Additional requirements for the conveyance of APDUs of operations pathRetain and serviceAvailable are given in A.3.2 of annex A.*

#### 6.3.3.2 Notification indicator information element

The notification defined above shall be coded in the Notification indicator information element in accordance with ETS 300 239.

#### 6.3.3.3 Other information elements

Any other information elements (e.g. Cause, Progress indicator) shall be coded in accordance with the rules of ETS 300 172.

### 6.3.4 Messages

The Facility information element and the Notification indicator information element shall be conveyed in the messages as specified in clause 10 of ETS 300 239.

Messages used for call establishment and release shall be as specified in ETS 300 172.

## 6.4 SS-CO state definitions

### 6.4.1 States at the Originating PTNX

The procedures for the Originating PTNX are written in terms of the following conceptual states existing within the SS-CO Supplementary Service Control entity in that PTNX in association with a particular call.

#### 6.4.1.1 State CO-Idle

SS-CO is not operating.

#### 6.4.1.2 State CO-Wait-Ack

The Originating PTNX has requested SS-CO and is waiting for an acknowledgement from the Terminating PTNX.

### 6.4.2 States at the Terminating PTNX

The procedures for the Terminating PTNX are written in terms of the following conceptual states existing within the SS-CO Supplementary Service Control entity in that PTNX in association with a particular call.

#### 6.4.2.1 State CO-Idle

SS-CO is not operating.

#### 6.4.2.2 State CO-Dest-Invoked

SS-CO has been invoked successfully.

## 6.5 SS-CO signalling procedures for activation, deactivation and registration

Not applicable.

## 6.6 SS-CO signalling procedures for invocation and operation

The following procedures are call-associated.

SS-CO may be invoked in two ways depending on whether the network connection is retained when a call encounters a busy called user. Retention of the network connection makes use of a generic path retention mechanism, which is specified in annex A.

Annex C contains some examples of message sequences.

### 6.6.1 Actions at the Originating PTNX

For a given call, the Originating PTNX shall choose one of the following two methods for invocation of SS-CO:

– invocation without path retention;
– invocation with path retention.

For invocation with path retention, the procedures specified below apply in conjunction with the procedures specified in A.5.1 of annex A.

For each method, if the basic call clears in circumstances other than those covered below, SS-CO shall terminate, any SS-CO timer shall be stopped, and state CO-Idle shall be entered (e.g. on calling user release, call failure, etc.).

The SDL representation of procedures at the Originating PTNX is shown in D.1 of annex D.

#### 6.6.1.1 Normal procedures

To invoke SS-CO the Originating PTNX shall send a callOfferRequest invoke APDU, start timer T1 and enter state CO-Wait-Ack. For invocation without path retention, the APDU shall be sent in the SETUP message that establishes the call. For invocation with path retention, the APDU shall be sent in a FACILITY message using the call reference of a call for which the network connection has been retained in accordance with A.5.1 of annex A (Path Retention state PRTO-Retained) and for which the received serviceAvailable invoke APDU indicated that SS-CO is invokable.

In state CO-Wait-Ack, on receipt of a callOfferRequest return result APDU in a PROGRESS, a FACILITY or an ALERTING message, the Originating PTNX shall stop timer T1 and shall enter state CO-Idle.

*NOTE*

*Successful invocation of SS-CO should be indicated to the calling user.*

*NOTE*

*The completion of SS-CO will be indicated by release of the call, receipt of an ALERTING or a CONNECT message (handled in accordance with ETS 300 172) or receipt of a NOTIFY message containing notification description value "remoteUserAlerting" (handled in accordance with ETS 300 239).*

#### 6.6.1.2 Exceptional procedures

In state CO-Wait-Ack, on receipt of:

- any message containing a callOfferRequest return error or reject APDU; or
- an ALERTING, CONNECT or DISCONNECT message without a callOfferRequest return result, return error or reject APDU,

the Originating PTNX shall stop timer T1 and enter state CO-Idle, and the call shall continue in accordance with ETS 300 172.

On expiry of timer T1 the Originating PTNX shall enter state CO-Idle and the call shall continue in accordance with ETS 300 172.

*NOTE*

*Failure of SS-CO should be indicated to the calling user.*

### 6.6.2 Actions at the Terminating PTNX

The Terminating PTNX shall support the two methods of invocation.

For invocation with path retention, the procedures specified below apply in conjunction with the procedures specified in A.5.2 of annex A.

For each method, if the basic call clears in circumstances other than those covered below, SS-CO shall terminate and state CO-Idle shall be entered.

The SDL representation of procedures at the Terminating PTNX is shown in D.2 of annex D.

#### 6.6.2.1 Normal procedures

If, while processing an incoming SETUP message in accordance with the procedures of ETS 300 172, the called user is found to be busy, and if the SETUP message contained a callOfferRequest invoke APDU, and if all conditions are met to allow SS-CO on the called user, the Terminating PTNX shall not send a DISCONNECT message but shall instead send a callOfferRequest return result APDU. If, having retained a network connection in accordance with A.5.2 of annex A and having indicated in the serviceAvailable invoke APDU that SS-CO is invokable, a FACILITY message is received containing a callOfferRequest invoke APDU, the Terminating PTNX shall check again whether the called user is busy, and if so, and if SS-CO is still invokable, shall send a callOfferRequest return result APDU.

On sending a callOfferRequest return result APDU, the Terminating PTNX shall enter state CO-Dest-Invoked.

*NOTE*

*The Terminating PTNX should, by appropriate means, inform the called user that a call is waiting and allow the user to accept the call or ignore the call.*

On entering the state CO-Dest-Invoked, the Terminating PTNX shall either enter protocol control state Call Received with the consequent sending of an ALERTING message, or shall remain in protocol control state Incoming Call Proceeding while the call is being offered to the called user. If an ALERTING message is not sent, the Terminating PTNX shall send a PROGRESS message containing a Progress indicator information element containing Progress description no. 8 "in-band information or appropriate pattern now available", if in-band tone or announcement is applied to the incoming B channel or if Progress description no. 8 has not been sent earlier in the call.

*NOTE*

*The Terminating PTNX can apply in-band tone or announcement to the incoming B-channel at this stage. However, even if no in-band tone or announcement is applied, the Progress description no. 8 is still required to be sent unless an ALERTING message is sent or Progress indicator no. 8 has been sent earlier in the call as a means of ensuring that basic call timer T310 is stopped at other PTNXs. If an ALERTING message is sent, it can contain a Progress indicator information element containing progress description no. 8 to indicate the presence of in-band tone or announcement.*

The return result APDU may be sent in the ALERTING or PROGRESS message. Otherwise it shall be sent separately in a FACILITY message.

In state CO-Dest-Invoked, if the called user becomes free and alerting commences, the Terminating PTNX shall send an ALERTING message if an ALERTING message has not been sent earlier or a NOTIFY message containing notification description value "remoteUserAlerting" if an ALERTING message has been sent earlier and shall enter state CO-Idle.

In state CO-Dest-Invoked, if the called user accepts the waiting call, the Terminating PTNX shall send a CONNECT message and shall enter state CO-Idle.

In state CO-Dest-Invoked, if the called user rejects the waiting call, the Terminating PTNX shall send a DISCONNECT message and shall enter state CO-Idle.

#### 6.6.2.2 Exceptional procedures

On receipt of a SETUP or FACILITY message containing a callOfferRequest invoke APDU, if the called user is not busy the call shall continue in accordance with ETS 300 172. The Terminating PTNX shall return a callOfferRequest return error APDU containing error notBusy in the resulting ALERTING or CONNECT message and shall remain in state CO-Idle.

*NOTE*

*If supplementary service Call Waiting has been invoked on the called user, the ALERTING message can also include a Notification indicator information element containing a notification description value "call is a waiting call".*

On receipt of a SETUP or FACILITY message containing a callOfferRequest invoke APDU, if the called user is busy but invocation of SS-CO is not possible the call shall be released in accordance with ETS 300 172 or, if continued retention of the path is required, shall continue in accordance with A.5.2. The Terminating PTNX shall return a callOfferRequest return error APDU containing an error other than notBusy in the resulting DISCONNECT or FACILITY message and shall remain in state CO-Idle.

### 6.6.3 Actions at a Transit PTNX

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

## 6.7 SS-CO impact of interworking with public ISDNs

On a call to a PTN from a public ISDN that does not support an equivalent service, SS-CO will not be requested.

On a call from a PTN to a public ISDN that does not support an equivalent service, the Outgoing Gateway PTNX shall behave as specified in sub-clause 6.6.2 for a Terminating PTNX at which conditions for invocation of SS-CO are not met.

*NOTE*

*At the time of publication of this ECMA Standard, no equivalent service was specified for public ISDNs.*

## 6.8 SS-CO impact of interworking with non-ISDNs

When interworking with a non-ISDN which does not support an equivalent service, the procedures defined in sub-clause 6.7 for interworking with a public ISDN that does not support an equivalent service shall apply.

When interworking with a non-ISDN which supports an equivalent service, the two networks may cooperate in the operation of SS-CO. In this case, either the Originating PTNX functionality or the Terminating PTNX functionality will be provided in the non-ISDN. The Incoming or Outgoing Gateway PTNX shall provide conversion between the signalling protocol specified in this ECMA Standard and the signalling protocol of the other network.

## 6.9 Protocol interactions between SS-CO 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 Standard. For interactions with supplementary services and ANFs for which stage 3 standards are published subsequent to the publication of this Standard, see those other stage 3 standards.

*NOTE*

*Simultaneous conveyance of APDUs for SS-CO 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.*

### 6.9.1 Interaction with Calling Name Identification Presentation (SS-CNIP)

No interaction.

### 6.9.2 Interaction with Connected Name Identification Presentation (SS-CONP)

No interaction.

### 6.9.3 Interaction with Call Forwarding Unconditional (SS-CFU)

The following interaction shall apply if SS-CFU is supported in accordance with ETS 300 257.

#### 6.9.3.1 Actions at the Rerouteing PTNX

When executing call forwarding, the Rerouteing PTNX shall act as follows:

– Include a callOfferRequest invoke APDU in the SETUP message to the Diverted-to PTNX if either:

  - this was included in the SETUP message to the Diverting PTNX and a callOfferRequest return error APDU has not been sent by the Diverting PTNX to the Originating PTNX; or
  - SS-CO was invoked successfully at the diverting user following path retention.

– Include a pathRetain invoke APDU with callOffer bit set to ONE in the SETUP message to the Diverted-to PTNX if and only if this was included in the SETUP message to the Diverting PTNX and neither a callOfferRequest return result APDU nor a callOfferRequest return error APDU has been sent by the Diverting PTNX to the Originating PTNX.

– Discard a callOfferRequest return result APDU or callOfferRequest return error APDU received from the Diverted-to PTNX if a callOfferRequest invoke APDU has been sent by the Rerouteing PTNX to the Diverted-to PTNX and either a callOfferRequest return result APDU or callOfferRequest return error APDU has been sent by the Diverting PTNX to the Originating PTNX.

*NOTE*

*This interaction takes into account the possible use of SS-CFU signalling in support of Call Deflection Immediate, which can be invoked following SS-CO.*

#### 6.9.3.2 Actions at the Originating PTNX

In order to invoke SS-CO without path retention after a call has encountered a busy diverted-to user, the Originating PTNX shall include a callOfferRequest invoke APDU in addition to the divertingLegInformation2 invoke APDU in the SETUP message of the new call to the diverted-to user.

### 6.9.4 Interaction with Call Forwarding Busy (SS-CFB)

The following interaction shall apply if SS-CFB is supported in accordance with ETS 300 257.

#### 6.9.4.1 Actions at the Rerouteing PTNX

On receiving a callRerouting invoke APDU, the Rerouteing PTNX shall include in the SETUP message to the Diverted-to PTNX any callOfferRequest invoke APDU or pathRetain invoke APDU with bit callOffer set to ONE that has been sent in the original SETUP message.

#### 6.9.4.2 Actions at the Originating PTNX

In order to invoke SS-CO without path retention directly at the last busy diverted-to user after a call has encountered two or more busy users that have been reached as a result of one or more invocations of SS-CFB,

the Originating PTNX shall include a callOfferRequest invoke APDU in addition to the divertingLegInformation2 invoke APDU in the SETUP message of the new call to the busy diverted-to user.

If SS-CO is to be invoked at the first busy user after a call has encountered two or more busy users that have been reached as a result of one or more invocations of SS-CFB, the Originating PTNX shall act in one of the following ways:

– In order to invoke SS-CO without path retention at the first busy user, thereby overriding SS-CFB at that user, the Originating PTNX shall include a callOfferRequest invoke APDU and a cfbOverride invoke APDU in a Facility information element in the SETUP message of the new call. When conveying the invoke APDU of operation cfbOverride, the NFE shall be included as defined for operation callOfferRequest and the Interpretation APDU shall be included with value discardAnyUnrecognisedInvokePdu.

– In order to invoke SS-CO with path retention at the first busy user, thereby overriding SS-CFB at that user, the Originating PTNX shall include a pathRetain invoke APDU with bit callOffer set to ONE and a cfbOverride invoke APDU in a Facility information element in the SETUP message of the new call. When conveying the invoke APDU of operation cfbOverride, the NFE shall be included as defined for operation pathRetain and the Interpretation APDU shall be included with value discardAnyUnrecognisedInvokePdu.

#### 6.9.4.3 Actions at the Served (Called) User PTNX

On receiving a SETUP message containing a callOfferRequest invoke APDU together with a cfbOverride invoke APDU, if the called user is busy, SS-CFB shall be overridden and the procedures of SS-CO shall apply.

On receiving a SETUP message containing a pathRetain invoke APDU with bit callOffer set to ONE together with a cfbOverride invoke APDU, if the called user is busy, SS-CFB shall be overridden and the procedures of SS-CO shall apply.

### 6.9.5 Interaction with Call Forwarding No Reply (SS-CFNR)

No interaction.

### 6.9.6 Interaction with Call Transfer (SS-CT)

The following interaction shall apply if SS-CT is supported in accordance with ETS 300 261.

#### 6.9.6.1 Initiation of Call Transfer during Call Offer

*NOTE*

*SS-CT already allows call transfer during alerting, i.e. when the Transferring PTNX is in protocol control state Call Delivered.*

##### 6.9.6.1.1 Actions at the Transferring PTNX

If user A requests call transfer for two calls in which the user is involved, one of the calls (primary call) being in protocol control state Active and the other call (secondary call) in protocol control state Outgoing Call Proceeding and for which SS-CO has been successfully invoked, the actions at the Transferring PTNX of SS-CT for transfer during alerting (i.e. when the secondary call is in protocol control state Call Delivered) shall apply.

##### 6.9.6.1.2 Actions at the Secondary PTNX

A PTNX shall treat as valid an APDU indicating that it is the Secondary PTNX for SS-CT also if the protocol state is Incoming Call Proceeding and SS-CO has been successfully invoked.

#### 6.9.6.2 Notifications to User B of SS-CT

##### 6.9.6.2.1 Actions at the Secondary PTNX for transfer by join

If call transfer by join is performed and the Secondary PTNX is also a SS-CO Terminating PTNX in state CO-Dest-Invoked, the Secondary PTNX may send a "call is a waiting call" notification, as defined in ETS 300 239, in a Notification indicator information element in a NOTIFY message to the Primary PTNX using the call reference on which the callTransferComplete invoke APDU was received. If this notification is not sent, then when user C of SS-CT becomes not busy, no remoteUserAlerting notification shall be sent.

#### 6.9.6.2.2 Actions at the Secondary PTNX for transfer by rerouteing

If call transfer by rerouteing is performed and the Secondary PTNX is also a SS-CO Terminating PTNX in state CO-Dest-Invoked, the Secondary PTNX may send a "call is a waiting call" notification, as defined in ETS 300 239, in a Notification indicator information element in addition to the callTransferSetup return result in the ALERTING message to the Primary PTNX. If this notification has been sent, the Secondary PTNX shall send a remoteUserAlerting notification in a Notification indicator information element in a NOTIFY message to the Primary PTNX when User C of SS-CT becomes not busy.

### 6.9.7 Interaction with Path Replacement (ANF-PR)

No interaction.

### 6.9.8 Interaction with Call Completion to Busy Subscriber (SS-CCBS)

No interaction.

### 6.9.9 Interaction with Call Completion on No Reply (SS-CCNR)

No interaction.

### 6.9.10 Interaction with Do Not Disturb (SS-DND)

No interaction.

### 6.9.11 Interaction with Do Not Disturb Override (SS-DNDO)

The following interaction shall apply if SS-DNDO is supported in accordance with ETS 300 364.

#### 6.9.11.1 Actions at the Terminating PTNX

On receiving a SETUP message containing a callOfferRequest invoke APDU together with a doNotDisturbOverrideQ invoke APDU, the procedures of SS-DNDO shall apply and, if SS-DND is not active or is successfully overridden, the procedures of SS-CO shall apply.

### 6.9.12 Interaction with Call Intrusion (SS-CI)

The following interaction shall apply if SS-CI is supported in accordance with prETS 300 426.

#### 6.9.12.1 Actions at the Originating PTNX

While SS-CO is in progress, the Originating PTNX may request SS-CI by sending a callIntrusionRequest invoke APDU in a FACILITY message during basic call protocol state Outgoing Call Proceeding or Call Delivered, starting timer T1 of SS-CI and entering state CI-Wait-Ack. The procedures of SS-CI shall then apply.

#### 6.9.12.2 Actions at the Terminating PTNX

##### 6.9.12.2.1 Normal Procedures

After SS-CO has been successfully invoked and prior to completion of SS-CO, on receipt of a callIntrusionRequest invoke APDU in a FACILITY message, the Terminating PTNX shall act in accordance with SS-CI.

*NOTE*

*If SS-CI is successfully invoked, SS-CO returns to state CO-Idle, since a CONNECT message is sent.*

##### 6.9.12.2.2 Exceptional Procedures

The procedures of SS-CI shall apply. If SS-CI is rejected, SS-CO shall continue.

## 6.10 SS-CO parameter values (timers)

**Timer T1**

Timer T1 shall operate at the Originating PTNX during state CO-Wait-Ack. Its purpose is to protect against an absence of response to SS-CO invocation.

Timer T1 shall have a value not less than 30 s.

# Annex A

**(normative)**

## Signalling protocol for the support of Path Retention

This annex is applicable to Originating PTNXs that support SS-CO with path retention and to Terminating PTNXs that support SS-CO. A similar annex will appear in other standards that make use of the generic mechanism for path retention.

### A.1 Path Retention description

Path retention is a generic mechanism which can be used by supplementary services during call establishment.

Path retention is invoked by the Originating PTNX either for one supplementary service or for several supplementary services at the same time. Invocation for a particular supplementary service means that the network connection is to be retained if the Terminating PTNX encounters conditions in which it is appropriate to invoke that supplementary service. The Originating PTNX is informed of the reason for retaining the connection so that it can decide (e.g. by consulting the calling user) whether to invoke the supplementary service. Under some circumstances in which the network connection is retained, more than one of the supplementary services for which path retention has been invoked may be applicable.

Successive retentions of the network connection by the Terminating PTNX following a single invocation of path retention by the Originating PTNX are possible as a result of different conditions being encountered at the Terminating PTNX. When an attempt is made to invoke a supplementary service for which the network connection has been retained, a further condition can be encountered that can cause the network connection to be retained again for the same supplementary service or a different supplementary service.

Path retention is specified in terms of a Path Retention entity existing within the Coordination Function at the Originating PTNX and at the Terminating PTNX.

### A.2 Path Retention operational requirements

#### A.2.1 Requirements on the Originating PTNX

Call establishment procedures for the outgoing side of an inter-PTNX link, as specified in ETS 300 172, shall apply.

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

#### A.2.2 Requirements on the Terminating PTNX

Call establishment procedures for the incoming side of an inter-PTNX link, as specified in ETS 300 172, shall apply.

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

#### A.2.3 Requirements on a Transit PTNX

Call establishment procedures, as specified in ETS 300 172, shall apply.

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

## A.3 Path Retention coding requirements

### A.3.1 Operations

The operations pathRetain and serviceAvailable as defined in sub-clause 6.3.1 shall apply. Within the ARGUMENT of operation pathRetain, the element of type ServiceList may contain bits other than those named in sub-clause 6.3.1, in order to request path retention for other supplementary services. Within the ARGUMENT of operation serviceAvailable, the element of type ServiceList may contain bits other than those named in sub-clause 6.3.1, in order to indicate retention of the network connection for other supplementary services.

### A.3.2 Information elements

APDUs of the operations pathRetain and serviceAvailable shall be coded in the Facility information element in accordance with ETS 300 239.

When conveying an APDU of operation pathRetain or serviceAvailable, the NFE shall be included. In the case of an invoke APDU the destinationEntity data element of the NFE shall contain value endPTNX.

When conveying an invoke APDU of operation pathRetain or serviceAvailable, the Interpretation APDU shall contain value discardAnyUnrecognisedInvokePdu.

### A.3.3 Messages

The Facility information element shall be conveyed in the messages as specified in clause 10 of ETS 300 239. The basic call messages shall be used for call establishment as specified in ETS 300 172.

## A.4 Path Retention state definitions

### A.4.1 States at the Originating PTNX

The procedures at the Originating PTNX are written in terms of the following conceptual states existing within the Path Retention entity in that PTNX in association with a particular call.

#### A.4.1.1 PRTO-Idle

Path retention is not operating.

#### A.4.1.2 PRTO-Requested

A pathRetain invoke APDU has been sent and the Originating PTNX is waiting for a serviceAvailable invoke APDU from the Terminating PTNX.

#### A.4.1.3 PRTO-Retained

A serviceAvailable invoke APDU has been received and the network connection is retained.

#### A.4.1.4 PRTO-Invoking

Invocation of a supplementary service is being attempted using a retained network connection.

### A.4.2 States at the Terminating PTNX

The procedures at the Terminating PTNX are written in terms of the following conceptual states existing within the Path Retention entity in that PTNX in association with a particular incoming call.

#### A.4.2.1 PRTT-Idle

Path retention is not operating.

#### A.4.2.2 PRTT-Requested

A pathRetain invoke APDU has been received and the Terminating PTNX is waiting until conditions for retaining the network connection are encountered.

#### A.4.2.3 PRTT-Retained

A serviceAvailable invoke APDU has been sent and the network connection is retained.

#### A.4.2.4 PRTT-Invoking

Invocation of a supplementary service is being attempted using a retained network connection.

## A.5 Path Retention signalling procedures for invocation and operation

### A.5.1 Actions at the Originating PTNX

The SDL representation of procedures at the Originating PTNX is shown in A.9.1.

On sending a SETUP message for call establishment, if path retention is required for allowing the possibility of invoking one or more supplementary services on encountering certain conditions at the Terminating PTNX, the Originating PTNX shall include a pathRetain invoke APDU in the SETUP message and shall enter state PRTO-Requested. In the element of type ServiceList in the ARGUMENT, any bit corresponding to a supplementary service for which path retention is required shall be set to ONE and all other bits shall be set to ZERO.

On receipt of a serviceAvailable invoke APDU in a PROGRESS or a FACILITY message in state PRTO-Requested, the Originating PTNX shall enter state PRTO-Retained.

In state PRTO-Requested, if the Originating PTNX determines that retention of the network connection can no longer occur (e.g. on receipt of a CONNECT message), it shall enter state PRTO-Idle.

During state PRTO-Retained, invocation of any of the supplementary services indicated in the serviceAvailable invoke APDU may be requested. If invocation is requested (by sending the appropriate APDU in a FACILITY message), the Terminating PTNX shall enter state PRTO-Invoking.

In state PRTO-Invoking, if the supplementary service concerned is successfully invoked, the Originating PTNX shall either:

i) if there is a possibility of the network connection being retained again prior to completion of call establishment (e.g. to allow for the possibility of invoking another supplementary service or for the possibility of invoking the same supplementary service again), enter state PRTO-Requested again; or

ii) enter state PRTO-Idle.

In state PRTO-Invoking, if the supplementary service concerned fails to be invoked successfully, the Originating PTNX shall either:

i) if the network connection is still retained to allow the possibility of invoking another supplementary service, enter state PRTO-Retained again; or

ii) enter state PRTO-Idle.

If, in any state other than PRTO-Idle, the call is released, state PRTO-Idle shall be entered.

### A.5.2 Actions at the Terminating PTNX

The SDL representation of procedures at the Terminating PTNX is shown in A.9.2.

On receipt of a pathRetain invoke APDU in a SETUP message, the Terminating PTNX shall enter state PRTT-Requested and record the list of supplementary services for which path retention has been requested, as indicated by the element of type ServiceList.

If, during state PRTT-Requested, a condition is encountered in which it is appropriate to invoke one or more of the supplementary services for which path retention has been requested, the Terminating PTNX shall retain the network connection, send a serviceAvailable invoke APDU to the Originating PTNX, start timer PRT1 and enter state PRTT-Retained. In the element of type ServiceList in the ARGUMENT, any bit corresponding to a supplementary service that can be invoked at this stage and for which path retention has been requested shall be set to ONE and all other bits shall be set to ZERO. This procedure replaces the normal procedure appropriate to the condition that has been encountered.

The serviceAvailable invoke APDU shall be sent either in a FACILITY message or, if a PROGRESS message is to be sent at the same time, in the PROGRESS message. A PROGRESS message containing a Progress indicator information element with Progress description no. 8 "in-band information or appropriate pattern now available" shall be sent if this Progress description has not already been sent for this call.

*NOTE*

*It is necessary that this Progress description be sent, as a means of ensuring that basic call timer T310 is stopped at other PTNXs. However, if this Progress description has already been sent in conjunction with an earlier serviceAvailable invoke APDU for this call, it need not be repeated.*

In state PRTT-Requested, if the Terminating PTNX determines that retention of the network connection can no longer occur (e.g. on sending a CONNECT message), it shall enter state PRTT-Idle.

In state PRTT-Retained, on receipt of an invocation request from the Originating PTNX for any of the supplementary services for which the network connection has been retained, the Terminating PTNX shall stop timer PRT1 and enter state PRTT-Invoking.

In state PRTT-Invoking, if the supplementary service concerned is successfully invoked, the Terminating PTNX shall either:

i) if there is a possibility of the network connection being retained again prior to completion of call establishment (e.g. to allow for the possibility of invoking another supplementary service or for the possibility of invoking the same supplementary service again), enter state PRTT-Requested again; or

ii) enter state PRTT-Idle.

In state PRTT-Invoking, if the supplementary service concerned fails to be invoked successfully, the Terminating PTNX shall either:

i) continue to retain the network connection, return to state PRTT-Retained and start timer PRT1 if there are other supplementary services for which the network connection has been retained and that are still able to be invoked; or

ii) enter state PRTT-Idle and allow the call to proceed as specified for failure of the supplementary service concerned (e.g. initiate release of the call).

In case i), any APDU sent to the Originating PTNX to indicate failure of the requested supplementary service shall be sent in a FACILITY message.

On expiry of timer PRT1, the Terminating PTNX shall enter state PRTT-Idle and initiate call clearing in accordance with ETS 300 172.

If, in any state other than PRTT-Idle, the call is released, state PRTT-Idle shall be entered and timer PRT1, if running, shall be stopped.

### A.5.3 Actions at a Transit PTNX

No special actions are required in support of path retention.

## A.6 Path Retention impact of interworking with public ISDNs

On a call from a public ISDN that does not support an equivalent mechanism, path retention shall not be requested by the Incoming Gateway PTNX.

On a call from a PTN to a public ISDN that does not support an equivalent mechanism, the Outgoing Gateway PTNX shall, on encountering a condition in the public ISDN in which it is appropriate to invoke one or more of the supplementary services for which path retention has been requested, either:

i) proceed as if path retention had not been requested; or

ii) retain the network connection and allow invocation of the supplementary services concerned in accordance with A.5.2.

*NOTE*

*If invocation of a supplementary service is requested while the network connection is retained, the Outgoing Gateway PTNX is responsible for establishing a new network connection through the public ISDN in order to request invocation of the supplementary service. Failure to establish a new network connection (e.g. because of network congestion) can cause the Outgoing Gateway PTNX to reject the supplementary service and release the call.*

*NOTE*

*At the time of publication of this ECMA Standard, no equivalent mechanism was specified for public ISDNs.*

## A.7 Path Retention impact of interworking with non-ISDNs

When interworking with a non-ISDN that does not support an equivalent mechanism, the procedures defined in A.6 for interworking with a public ISDN that does not support an equivalent mechanism shall apply.

When interworking with a non-ISDN that does support an equivalent mechanism, the two networks may cooperate in the operation of path retention. In this case, either the Originating PTNX functionality or the Terminating PTNX functionality will be provided in the non-ISDN. The Incoming or Outgoing Gateway PTNX shall provide conversion between the signalling protocol specified in this ECMA Standard and the signalling protocol of the other network.

## A.8 Path Retention parameter values (timers)

Timer PRT1 operates at the Terminating PTNX during state PRTT-Retained. Its purpose is to protect against absence of a supplementary service invocation request as a response to the serviceAvailable invoke APDU.

Timer PRT1 shall have a value not less than 60 s.

## A.9 Specification and Description Language (SDL) - Representation of procedures (informative)

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

Each diagram represents the behaviour of a Path Retention entity at a particular type of PTNX. In accordance with the protocol model described in ETS 300 239, the Path Retention entity as a part of the Coordination Function uses the services of Generic Functional Procedures Control and Basic Call Control and provides services to the various SS Control entities.

Where an output symbol represents a primitive to other parts of the Coordination Function, and that primitive results in a QSIG message being sent, the output symbol bears the name of the message and any remote operations APDU 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 other parts of the Coordination Function, and that primitive results from receipt of a QSIG message, the input symbol bears the name of the message and any remote operations APDU contained in that message. In case of a message specified in ETS 300 172, basic call actions associated with the receipt of that message are deemed to occur.

The following abbreviation is used:

inv. invoke APDU

### A.9.1 SDL representation of Path Retention at the Originating PTNX

Figure A.1 shows the behaviour of a Path Retention entity within the Originating PTNX.

In figure A.1 output signals to the right represent messages sent via protocol control, input signals from the right represent messages received via protocol control, and input signals from the left represent internal primitives.

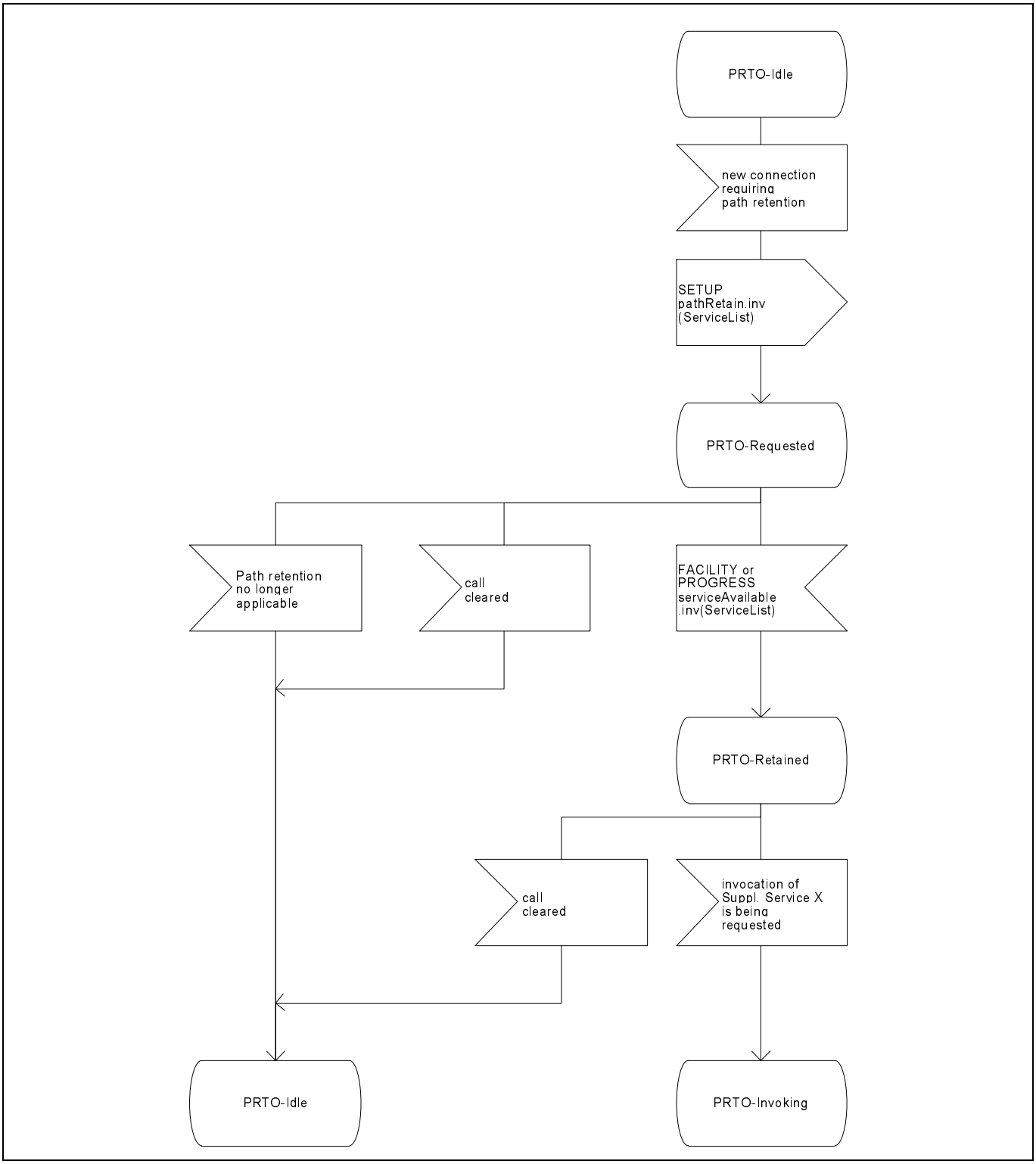



**Figure A.1 (sheet 1 of 2) - SDL representation of Path Retention at the Originating PTNX**

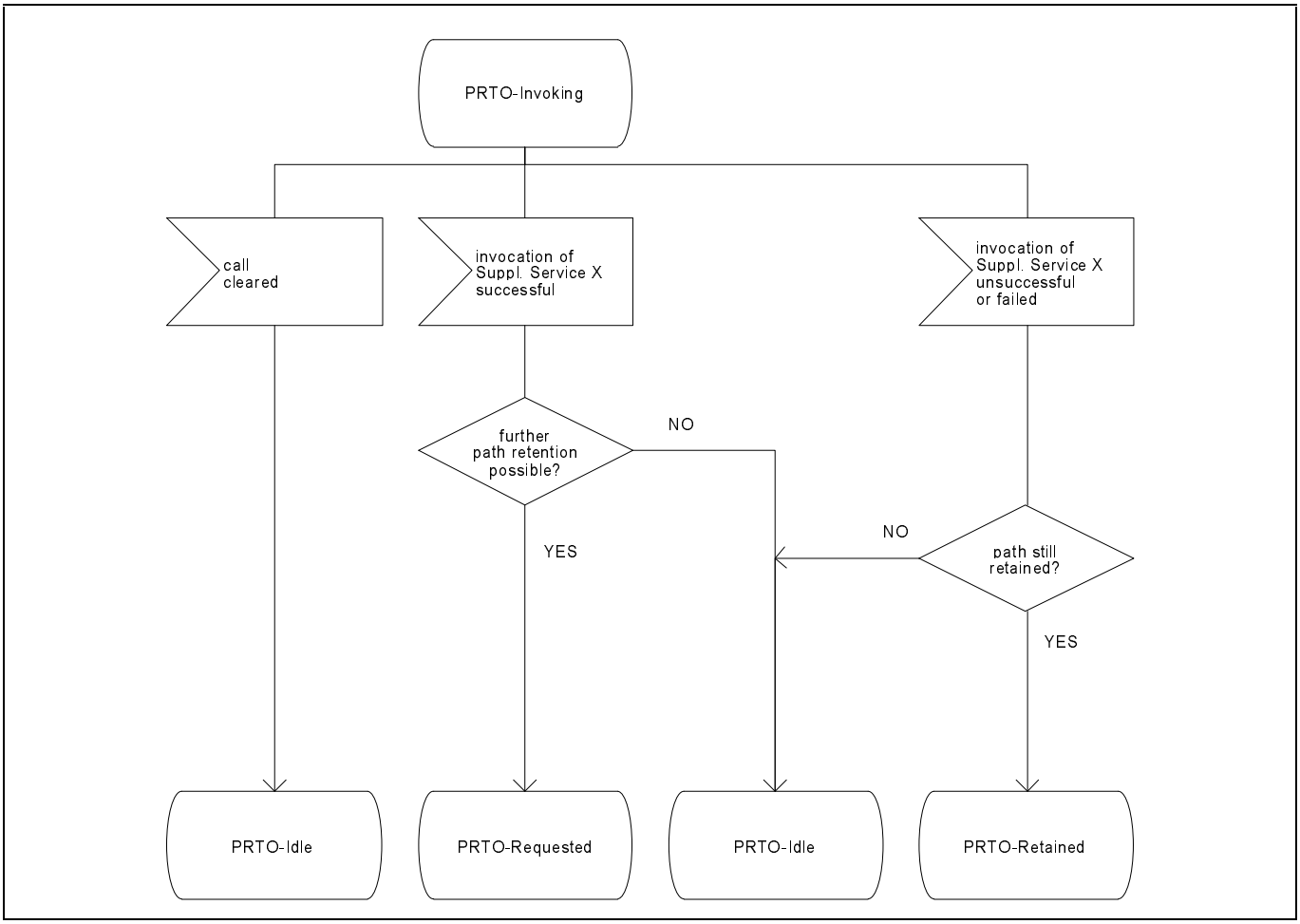



**Figure A.1 (sheet 2 of 2) - SDL representation of Path Retention at the Originating PTNX**

### A.9.2 SDL representation of Path Retention at the Terminating PTNX

Figure A.2 shows the behaviour of a Path Retention entity within the Terminating PTNX.

In figure A.2 output signals to the left represent messages sent via protocol control, input signals from the left represent messages received via protocol control, and input signals from the right represent internal primitives.

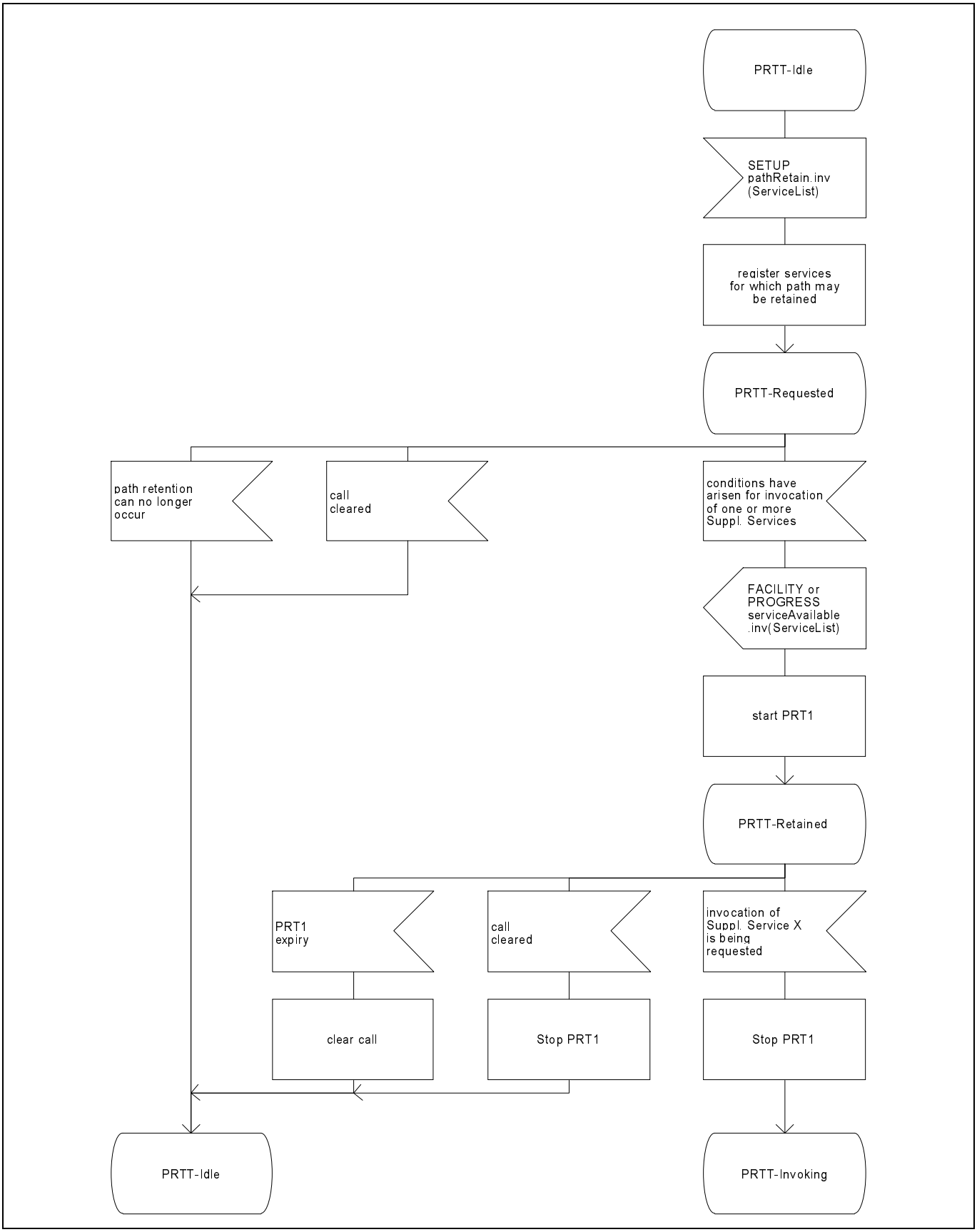



**Figure A.2 (sheet 1 of 2) - SDL representation of Path Retention at the Terminating PTNX**

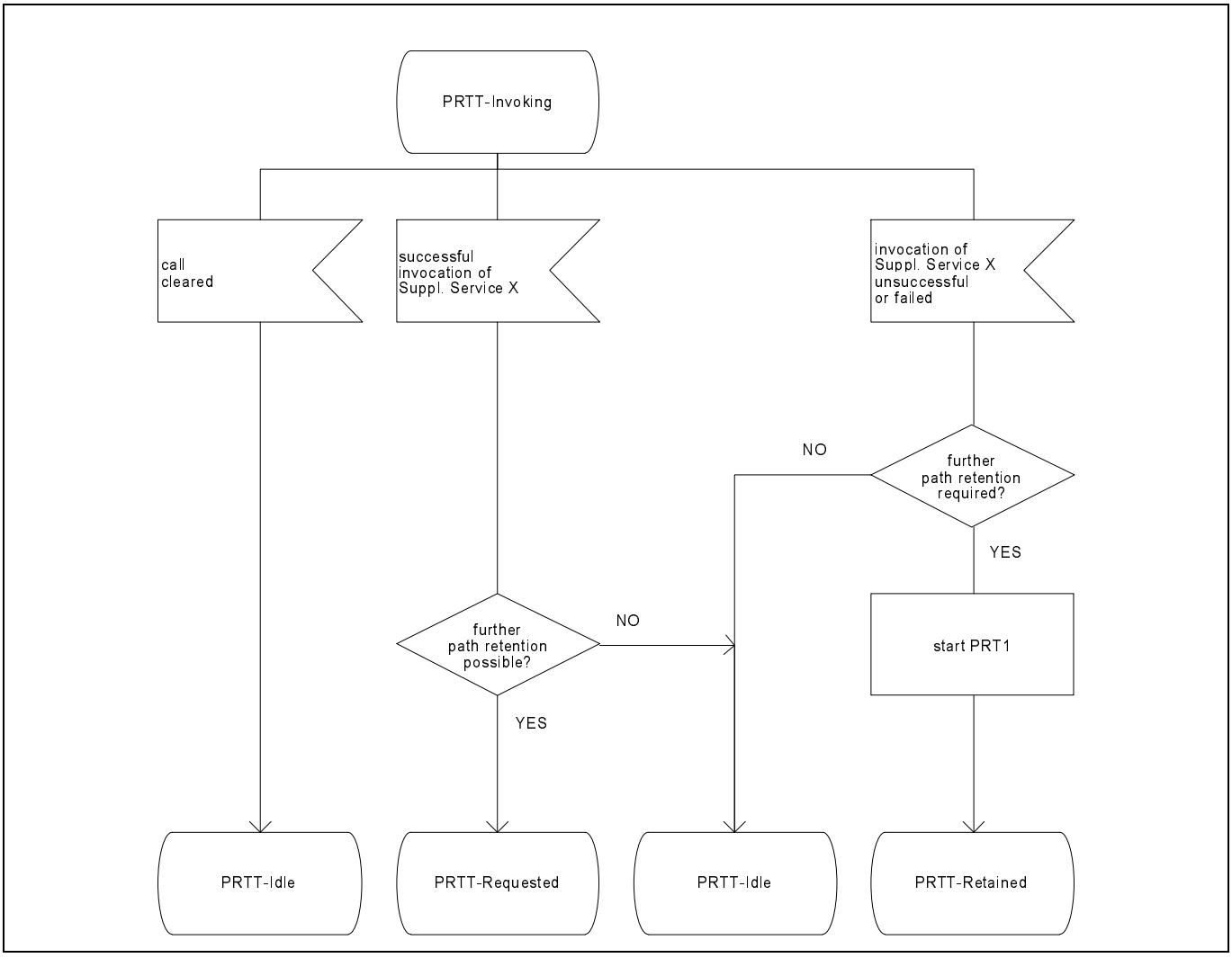



**Figure A.2 (sheet 2 of 2) - SDL representation of Path Retention at the Terminating PTNX**

# Annex B

**(normative)**

# Protocol Implementation Conformance Statement (PICS) proforma

## B.1 Introduction

The supplier of a protocol implementation which is claimed to conform to this ECMA 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 the 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.

## B.2 Instructions for completing the PICS proforma

### B.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 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 to conform 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 a restricted choice (Yes or No), or in the "Not Applicable" column (N/A).

### B.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 or expected that a large quantity will be supplied, and a PICS can be considered complete without any 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.

### B.2.3 Exception 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 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.

## B.3 PICS proforma for ECMA-192

### B.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 the requirement for full identification.

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

### B.3.2 Protocol summary

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

| |
|---|
| Date of statement |

### B.3.3 General

| Item | Question/feature | References | Status | N/A | Support |
|---|---|---|---|---|---|
| A1 | Support of SS-CO in Originating PTNX | 6.6.1 | o.1 | | Yes [ ] No [ ] |
| A2 | Support of SS-CO in Terminating PTNX | 6.6.2 | o.1 | | Yes [ ] No [ ] |
| A3 | Behaviour as Gateway to support SS-CO from user in PTNX to user in public ISDN | 6.7 | o | | Yes [ ] No [ ] |
| A4 | Behaviour as Gateway to support SS-CO from user in PTNX to user in other network | 6.8 | o | | Yes [ ] No [ ] |
| A5 | Behaviour as Gateway to support SS-CO from user in other network to user in PTNX | 6.8 | o | | Yes [ ] No [ ] |

### B.3.4 Procedures

| Item | Question/feature | References | Status | N/A | Support |
|---|---|---|---|---|---|
| B1 | Support of relevant ETS 300 172 and ETS 300 239 procedures | 6.2.1, 6.2.2, 6.2.3 | m | | Yes [ ] |
| B2 | SS-CO invocation without path retention in Originating PTNX | 6.6.1 | A1:o.2 | [ ] | Yes [ ] No [ ] |
| B3 | SS-CO invocation with path retention in Originating PTNX | 6.6.1, A.2.1, A.5.1 | A1:o.2 | [ ] | Yes [ ] No [ ] |
| B4 | SS-CO invocation without path retention in Terminating PTNX | 6.6.2 | A2:m | [ ] | Yes [ ] |
| B5 | SS-CO invocation with path retention in Terminating PTNX | 6.6.2, A.2.2, A.5.2 | A2:m | [ ] | Yes [ ] |

### B.3.5 Coding

| Item | Question/feature | References | Status | N/A | Support |
|---|---|---|---|---|---|
| C1 | Sending of callOfferRequest invoke APDU and receipt of callOfferRequest return result and error APDU in Originating PTNX | 6.3.1, 6.3.3.1 6.3.4 | A1:m | [ ] | Yes [ ] |
| C2 | Sending of pathRetain invoke APDU and receipt of serviceAvailable invoke APDU in Originating PTNX | 6.3.1, A.3 | B3:m | [ ] | Yes [ ] |
| C3 | Receipt of callOfferRequest invoke APDU and sending of callOfferRequest return result and error APDU in Terminating PTNX | 6.3.1, 6.3.3.1 6.3.4 | A2:m | [ ] | Yes [ ] |
| C4 | Receipt of pathRetain invoke APDU and sending of serviceAvailable invoke APDU in Terminating PTNX | 6.3.1, A.3 | A2:m | [ ] | Yes [ ] |
| C5 | Sending of notification "remoteUserAlerting" in Terminating PTNX | 6.3.2, 6.3.3.2 6.3.4 | A2:o | [ ] | Yes [ ] No [ ] |

### B.3.6 Timers

| Item | Question/feature | References | Status | N/A | Support |
|---|---|---|---|---|---|
| D1 | Support of timer T1 | 6.10 | A1:m | [ ] | Yes [ ]<br>Value [ ] |
| D2 | Support of timer PRT1 | A.8 | A2:m | [ ] | Yes [ ]<br>Value [ ] |

### B.3.7 Interactions with Call Forwarding Unconditional (SS-CFU)

| Item | Question/feature | Reference | Status | N/A | Support |
|---|---|---|---|---|---|
| E1 | Support of SS-CFU (Rerouteing PTNX) | | o | | Yes [ ] No [ ] |
| E2 | Support of SS-CFU (Originating PTNX) | | o | | Yes [ ] No [ ] |
| E3 | Interactions at Rerouteing PTNX | 6.9.3.1 | E1:m | [ ] | m: Yes [ ] |
| E4 | Interactions at Originating PTNX | 6.9.3.2 | c.1 | [ ] | m: Yes [ ] |

c.1: if (A1 and E2) then mandatory, else N/A

### B.3.8 Interactions with Call Forwarding Busy (SS-CFB)

| Item | Question/feature | Reference | Status | N/A | Support |
|---|---|---|---|---|---|
| F1 | Support of SS-CFB (Originating PTNX) | | o | | Yes [ ] No [ ] |
| F2 | Support of SS-CFB (Rerouteing PTNX) | | o | | Yes [ ] No [ ] |
| F3 | Support of SS-CFB (Served User PTNX) | | o | | Yes [ ] No [ ] |
| F4 | Interactions at Rerouteing PTNX | 6.9.4.1 | c.1 | [ ] | m: Yes [ ] |
| F5 | Interactions at Originating PTNX | 6.9.4.2 | c.2 | [ ] | m: Yes [ ] |
| F6 | Interactions at Served User PTNX | 6.9.4.3 | c.3 | [ ] | m: Yes [ ] |

c.1: if (A1 or A2) and F2 then mandatory, else N/A
c.2: If (A1 and F1) then mandatory, else N/A
c.3: if (A2 and F3) then mandatory, else N/A

### B.3.9 Interactions with Call Transfer (SS-CT)

| Item | Question/feature | Reference | Status | N/A | Support |
|---|---|---|---|---|---|
| G1 | Support of SS-CT (transfer by join) | | o | | Yes [ ] No [ ] |
| G2 | Support of SS-CT (transfer by rerouteing) | | o | | Yes [ ] No [ ] |
| G3 | Interactions at Initiation of SS-CT during SS-CO at Transferring PTNX | 6.9.6.1.1 | c.1 | [ ] | m: Yes [ ] |
| G4 | Interactions at Initiation of SS-CT during SS-CO at Secondary PTNX | 6.9.6.1.2 | c.2 | [ ] | m: Yes [ ] |
| G5 | Interactions between SS-CT by join and SS-CO for notifications at Secondary PTNX | 6.9.6.2.1 | c.3 | [ ] | m: Yes [ ] |
| G6 | Interactions between SS-CT by rerouteing and SS-CO for notification at Secondary PTNX | 6.9.6.2.2 | c.4 | [ ] | m: Yes [ ] |

c.1: if (A1 and G1) or (A1 and G2) then mandatory, else N/A
c.2: if (A2 and G1) or (A2 and G2) then mandatory, else N/A
c.3: If (A2 and G1) then mandatory, else N/A
c.4: if (A2 and G2) then mandatory, else N/A

### B.3.10 Interactions with Do Not Disturb Override (SS-DNDO)

| Item | Question/feature | Reference | Status | N/A | Support |
|---|---|---|---|---|---|
| H1 | Support of SS-DNDO (Terminating PTNX) | | o | | Yes [ ] No [ ] |
| H2 | Interactions at the Terminating PTNX | 6.9.11.1 | c.1 | [ ] | m: Yes [ ] |

c.1: if (A2 and H1) then mandatory, else N/A

### B.3.11 Interactions with Call Intrusion (SS-CI)

| Item | Question/feature | Reference | Status | N/A | Support |
|---|---|---|---|---|---|
| I1 | Support of SS-CI (Originating PTNX) | | o | | Yes [ ] No [ ] |
| I2 | Support of SS-CI (Terminating PTNX) | | o | | Yes [ ] No [ ] |
| I3 | Interactions at the Originating PTNX | 6.9.12.1 | c.1 | [ ] | Yes [ ] No [ ] |
| I4 | Interactions at the Terminating PTNX | 6.9.12.2 | c.2 | [ ] | Yes [ ] No [ ] |

c.1: if (A1 and I1) then optional, else N/A
c.2: if (A2 and I2) then optional, else N/A

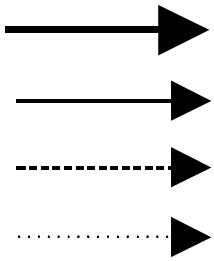
## Annex C

**(informative)**

## Examples of message sequences

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

1 The following notation is used:



**Basic call message containing SS-CO information.**

**Basic call message without SS-CO information.**

**Symbolic primitive carrying SS-CO information.**

**Symbolic primitive without SS-CO information.**

| | |
|---|---|
| **xxx.inv** | **Invoke APDU for operation xxx** |
| **xxx.res** | **Return result APDU for operation xxx** |
| **xxx.err** | **Return error APDU for operation xxx** |

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

3 Only the relevant information content (e.g. remote operation APDU, notifications, information elements) is listed below each message name. The Facility and Notification indicator information elements containing remote operation APDUs and notifications are not explicitly shown. Information with no impact on SS-CO is not shown.

4 Some interactions with users are included in the form of symbolic primitives. The actual protocol at the terminal interface is outside the scope of this Standard.

5 RELEASE, RELEASE COMPLETE messages are not shown.

6 The examples assume en-bloc sending.

7 The following abbreviations are used:

| | |
|---|---|
| coRequest | callOfferRequest |
| co request | SS-CO request |
| co confirm | SS-CO confirmation |
| co reject | SS-CO rejection |
| co indication | SS-CO indication |

## C.1 Example message sequence for normal operation of SS-CO without Path Retention

In this example the coRequest return result APDU is sent in an ALERTING message.

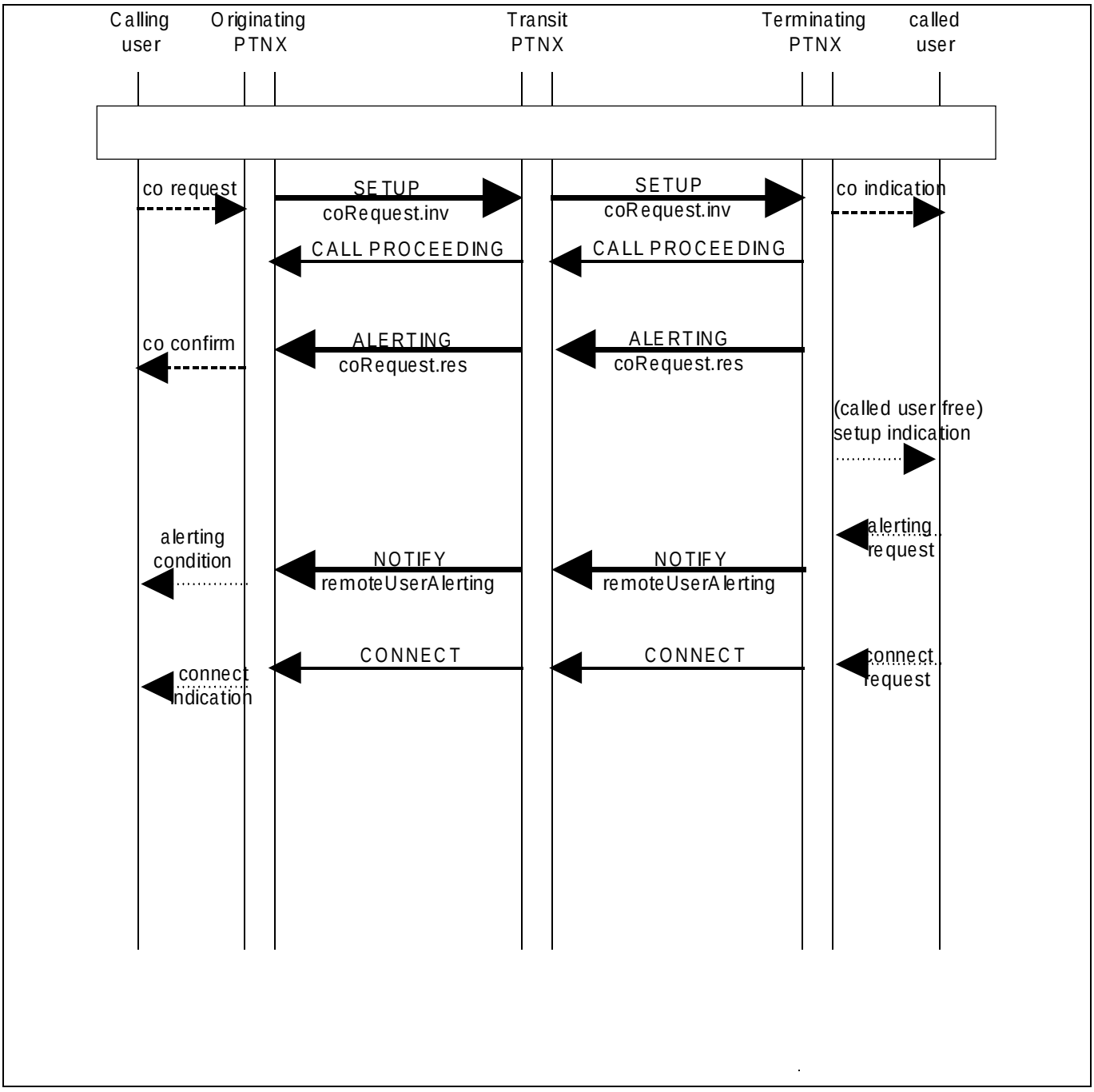



**Figure C.1 - Message sequence for normal operation of SS-CO without Path Retention**

## C.2 Example message sequence for normal operation of SS-CO with Path Retention

In this example the coRequest return result APDU is sent in a FACILITY message and the service completes when the called user is alerting.

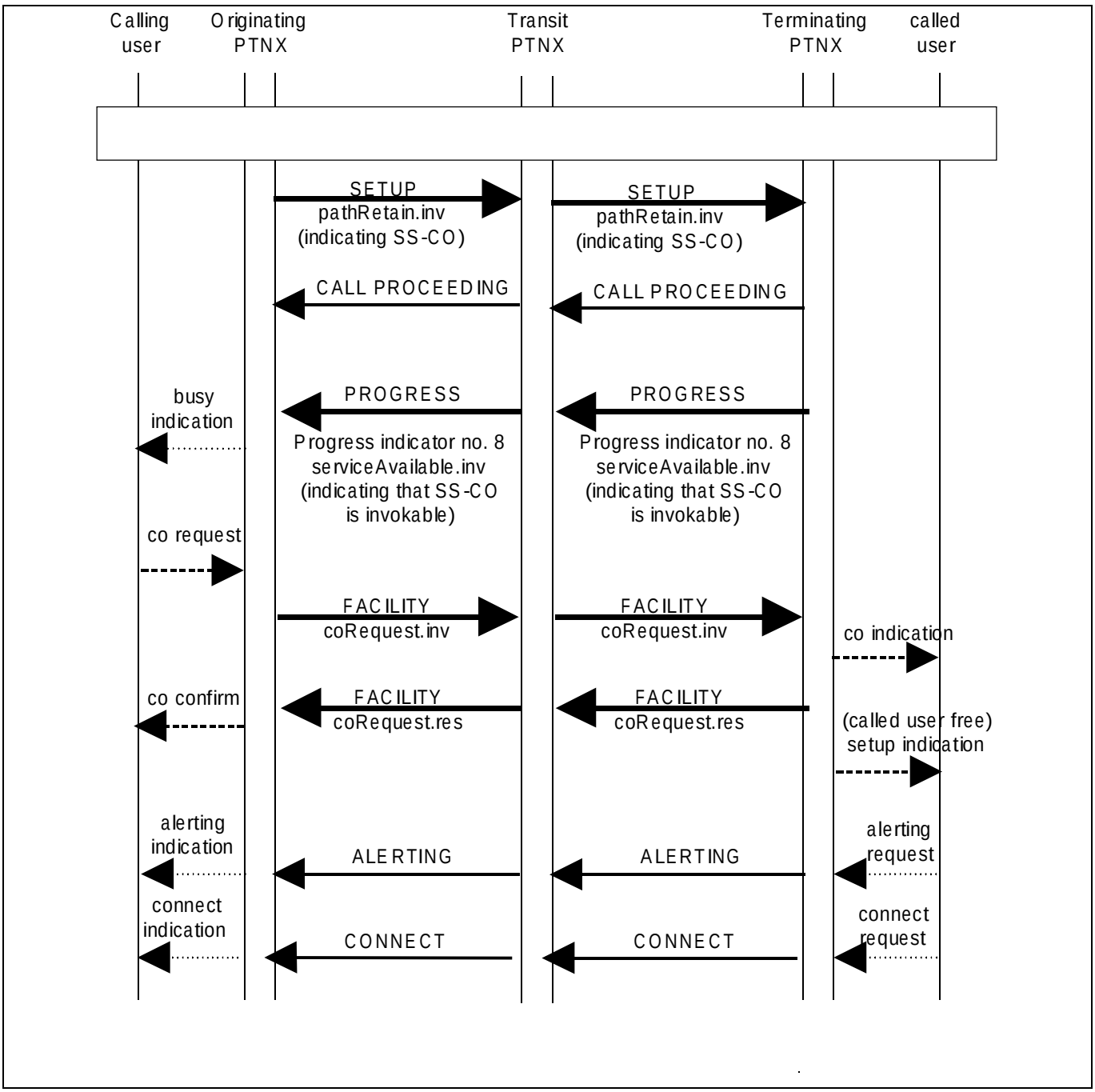



**Figure C.2 - Message sequence for normal operation of SS-CO with Path Retention**

## C.3 Example of unsuccessful invocation of SS-CO without Path Retention

In this example the request of SS-CO is rejected by the Terminating PTNX even though the called user is busy.

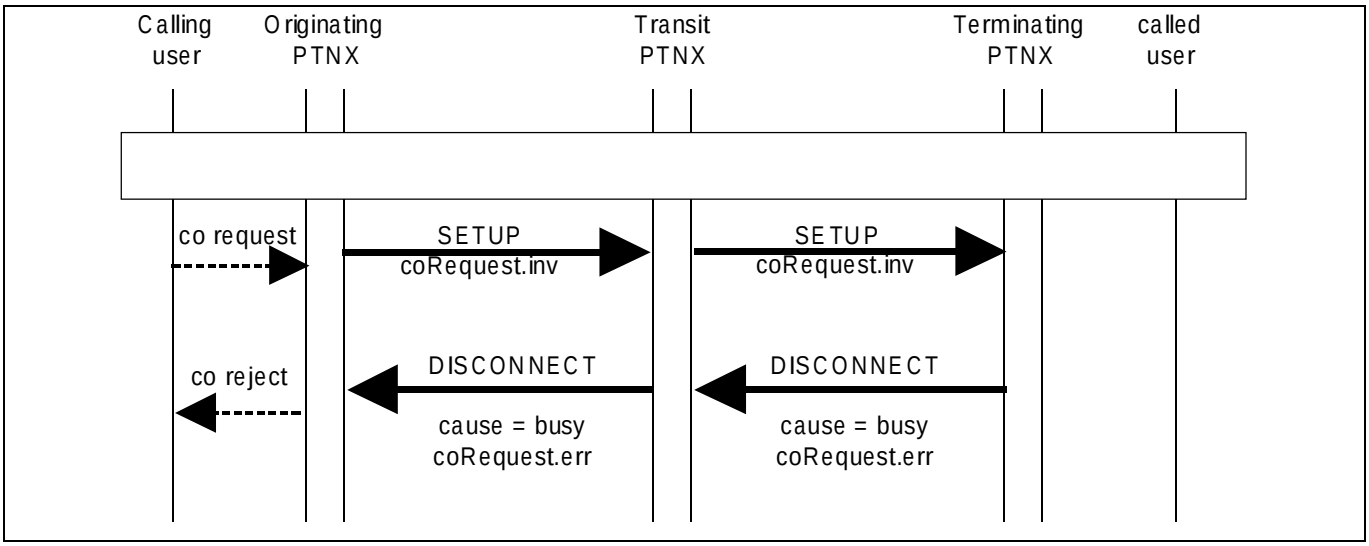



**Figure C.3 - Message sequence for unsuccessful invocation of SS-CO**

## C.4 Example of unsuccessful invocation of Path Retention for SS-CO

In this example the request for path retention for SS-CO is rejected by the Terminating PTNX and there is no other supplementary service for which the path is retainable.

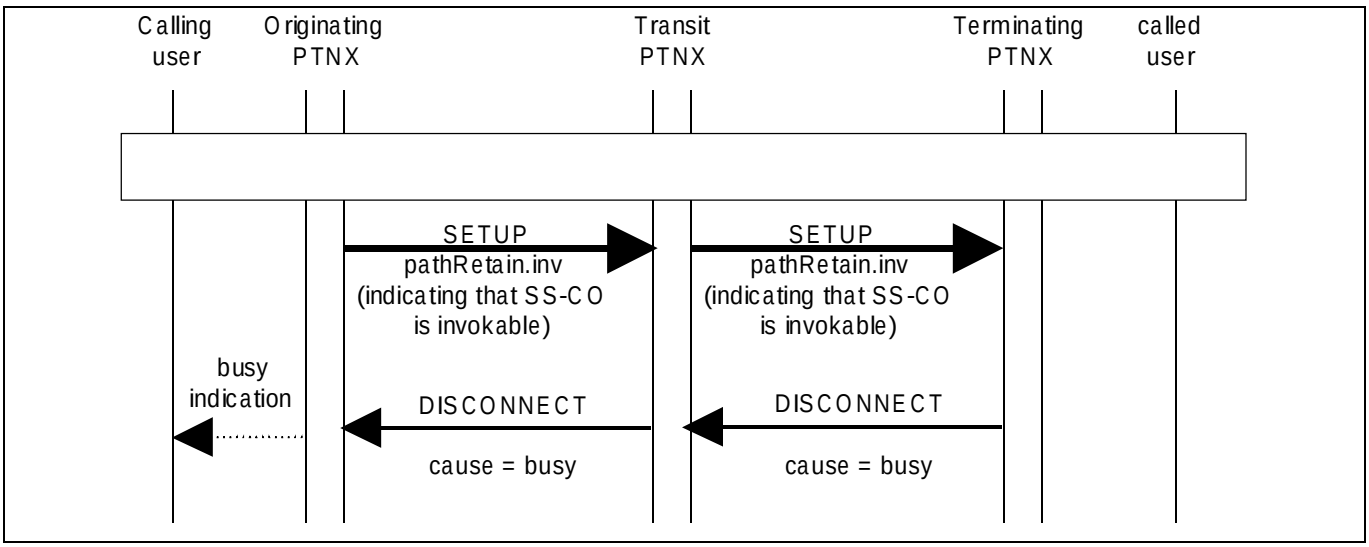



**Figure C.4 - Message sequence for unsuccessful invocation of Path Retention for SS-CO**

# 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 Rec. Z.100 (1988).

Each diagram represents the behaviour of an SS-CO 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 Coordination Function, the services of Generic Functional Procedures Control and Basic Call Control.

Where an output symbol represents a primitive to the Coordination Function, and that primitive results in a message being sent, the output symbol bears the name of the message and any remote APDU(s) or notification(s) contained in that message. In the 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 Coordination Function, and that primitive is the result of a message being received, the input symbol bears the name of the message and any remote operations APDU(s) or notification(s) contained in that message. In the case of a message specified in ETS 300 172, basic call actions associated with the receipt of that message are deemed to have occurred.

The following abbreviations are used:

| | |
|---|---|
| inv. | invoke APDU; |
| res. | return result APDU; |
| err. | return error APDU; |
| rej. | reject APDU; |
| coRequest | callOfferRequest. |

### D.1 SDL representation of SS-CO at the Originating PTNX

Figure D.1 shows the behaviour of an SS-CO entity within the Originating PTNX.

Input signals from the left and output signals to the left represent primitives from and to the user or an entity acting on behalf of the user.

Input signals from the right and output signals to the right represent primitives from and to the coordination function in respect of messages sent and received. Also protocol timer expiry is indicated by an input signal from the right.

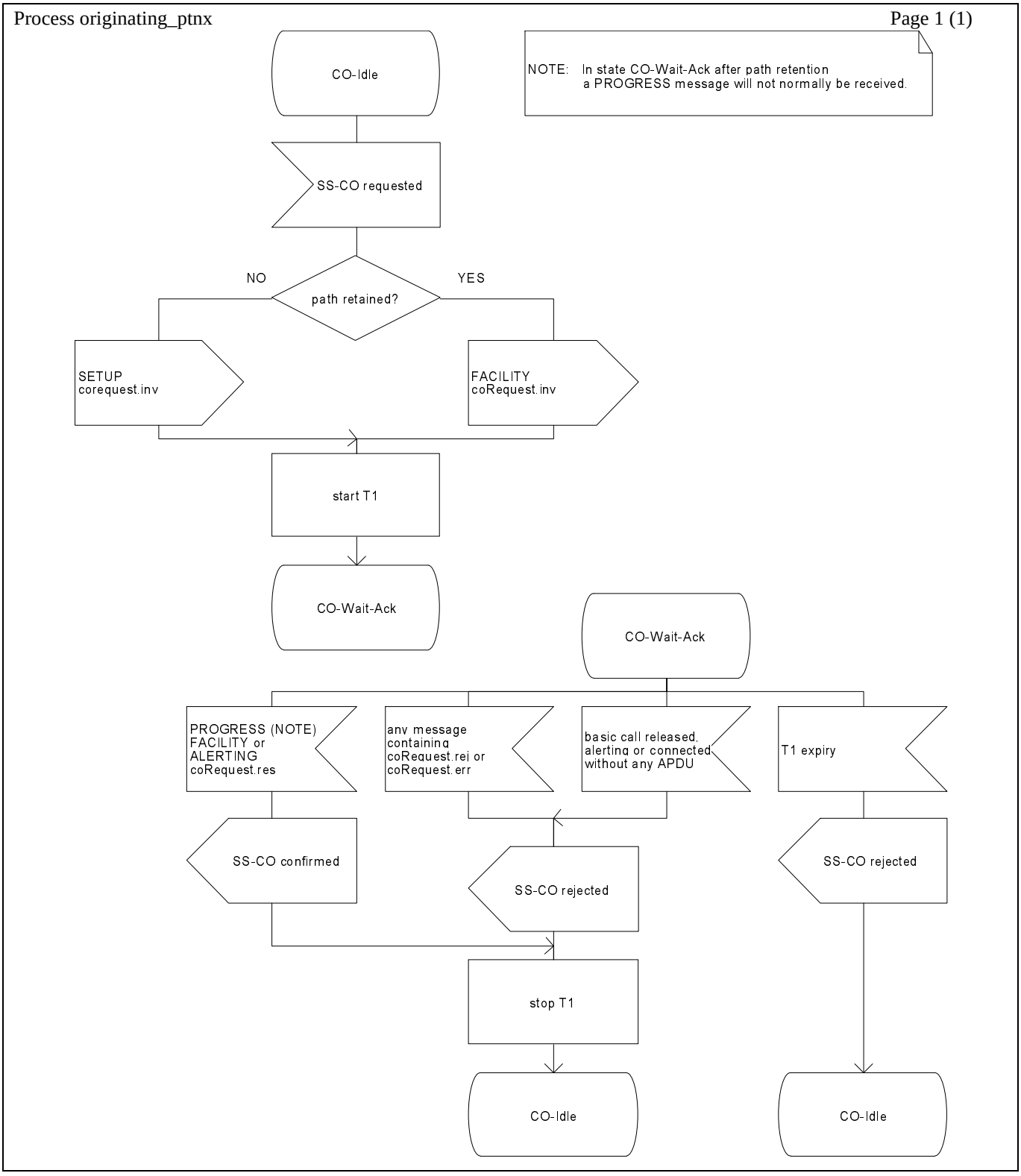



**Figure D.1 - Originating PTNX SDL**

## D.2 SDL representation of SS-CO at the Terminating PTNX

Figure D.2 shows the behaviour of an SS-CO entity within the Terminating PTNX.

Input signals from the right and output signals to the right represent primitives from and to the user.

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

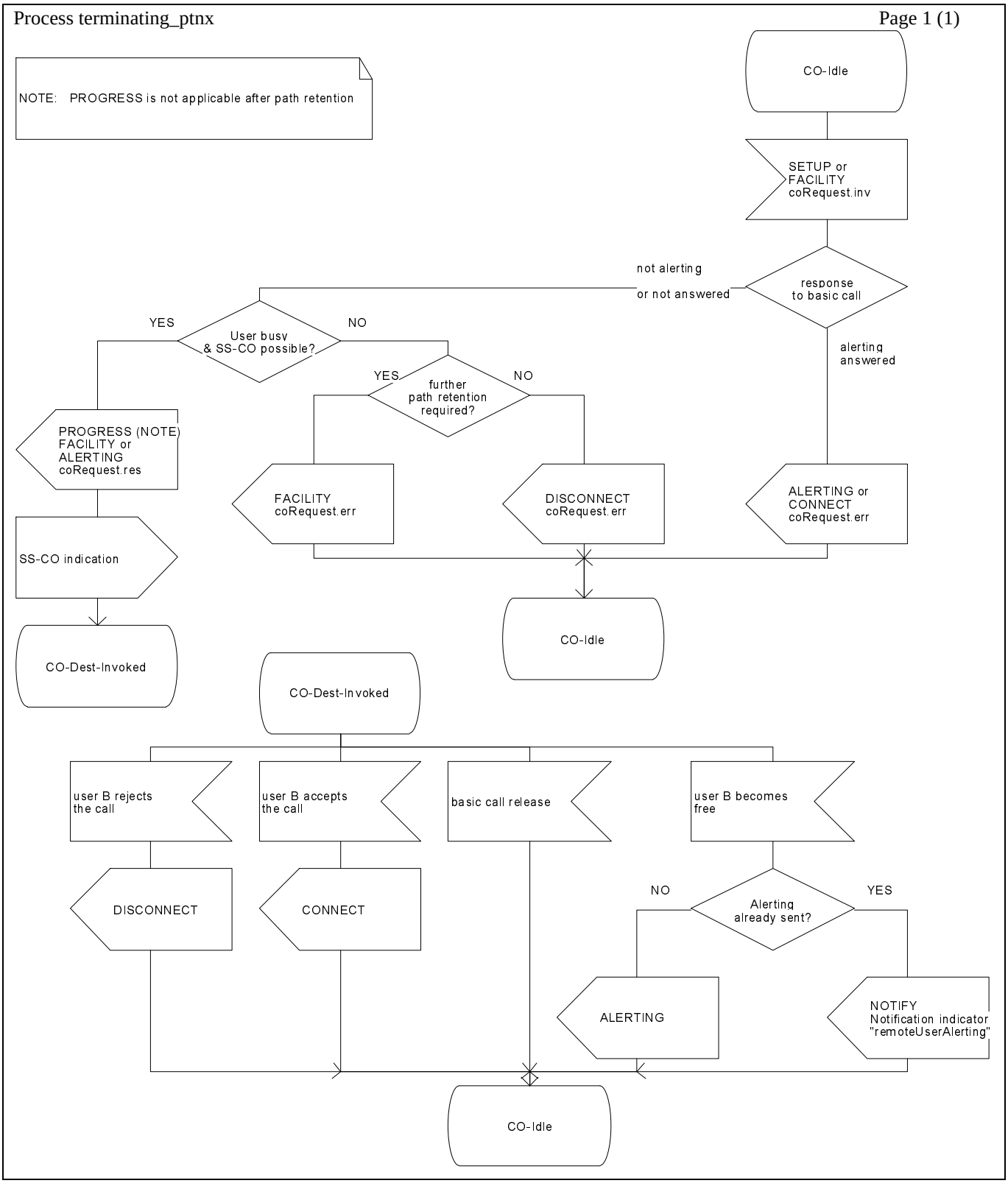



**Figure D.2 - Terminating PTNX SDL**

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