

E C M A

EUROPEAN COMPUTER MANUFACTURERS ASSOCIATION

STANDARD ECMA-192

PRIVATE TELECOMMUNICATION NETWORKS (PTN)

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INTER-EXCHANGE SIGNALLING PROTOCOL

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CALL OFFER SUPPLEMENTARY SERVICE

(QSIG-CO)

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**CALL OFFER SUPPLEMENTARY SERVICE
(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-TS 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-0052, with the intention of submission to ETSI as a proposed ETS.

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-TS, ETSI and other international and national standardization bodies. It represents a pragmatic and widely based consensus.

This ECMA Standard has been contributed to ETSI for adoption as an ETS.

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1 Scope

This 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 ECMA-133.

Service specifications are produced in three stages and according to the method specified in ENV 41005. This 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 ECMA-191.

The signalling protocol for SS-CO operates on top of the signalling protocol for basic circuit switched call control, as specified in ECMA-143, and uses certain aspects of the generic procedures for the control of supplementary services specified in ECMA-165.

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

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

2 Conformance

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

3 References

- | | |
|------------------|---|
| ECMA-133 | Reference Configurations for Calls through Exchanges of Private Telecommunication Networks (1989) |
| ECMA-142 | Specification, Functional Model and Information Flows for Control Aspects of Circuit Mode Basic Services in Private Telecommunication Networks (BCSD) (1990) |
| ECMA-143 | Private Telecommunication Network (PTN) - Inter-Exchange Signalling Protocol - Circuit Mode Basic Services (QSIG-BC) (1992) |
| ECMA-165 | Private Telecommunication Networks (PTN) - Inter-Exchange Signalling - Generic Functional Protocol for the Support of Supplementary Services (QSIG-GF) (1993) |
| ECMA-191 | Private Telecommunication Networks (PTN) - Specification, Functional Model and Information Flows - Call Offer Supplementary Service (COSD) (1993) |
| 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) |
| 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 Standard the following definitions apply.

4.1 External definitions

This Standard uses the following terms defined in other documents:

- Application Protocol Data Unit (APDU)	(ECMA-165)
- Basic Service	(CCITT Rec. I.210)
- Call, Basic Call	(ECMA-165)
- Coordination Function	(ECMA-165)
- Notification	(ECMA-165)
- Originating PTNX	(ECMA-143)
- Private	(ENV 41007)
- Private Telecommunication Network Exchange	(ENV 41007)
- Public ISDN	(ENV 41007)
- Signalling	(CCITT Rec. I.112)
- Supplementary Service	(CCITT Rec. I.210)
- Supplementary Service Control Entity	(ECMA-165)
- Telecommunication Network	(ENV 41007)
- Terminal	(ENV 41007)
- Terminating PTNX.	(ECMA-143)
- Transit PTNX	(ECMA-143)
- User	(ECMA-142)

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.

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-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.

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 ECMA-143, shall apply.

Generic procedures for the call-related control of supplementary services, as specified in ECMA-165 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 ECMA-143, shall apply.

Generic procedures for the call-related control of supplementary services, as specified in ECMA-165 for an End PTNX, shall apply.

6.2.3 Requirements on a Transit PTNX

Basic call procedures specified in ECMA-143 for a Transit PTNX shall apply.

Generic procedures for the call-related control of supplementary services, as specified in ECMA-165 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 identified-organization 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 identified-organization icd-ecma(0012) standard(0) qsig-generic-procedures(165) msi-definition(0)} notAvailable FROM General-Errors {ccitt(0) identified-organization(3) etsi (0) 196 general-errors (2)};
ptn OBJECT IDENTIFIER	::= { iso identified-organization 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, unspecified}

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

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

ServiceList ::= BIT STRING (SIZE(1..32)) {callOffer(0)}
-- 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}

callOfferRequest  CallOfferRequest ::= {ptn co-request(34)}
pathRetain        PathRetain      ::= {ptn path-retain(41)}
serviceAvailable  ServiceAvailable ::= {ptn service-available(42)}

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 identified-organization icd-ecma(0012) standard(0)
 qsig-call-offer(192) call-offer-notifications(1)}

DEFINITIONS ::=
BEGIN

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

RemoteUserAlerting ::= NOTIFICATION
                        ARGUMENT    NULL

remoteUserAlerting RemoteUserAlerting ::=
    {iso identified-organization 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 ECMA-165.

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.

6.3.3.2 Notification indicator information element

The notification defined above shall be coded in the Notification indicator information element in accordance with ECMA-165.

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 ECMA-143.

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 ECMA-165.

Messages used for call establishment and release shall be as specified in ECMA-143.

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 may confirm invocation of SS-CO to the calling user, shall stop timer T1 and shall enter state CO-Idle.

NOTE 1

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 ECMA-143) or receipt of a NOTIFY message containing notification description value "remoteUserAlerting" (handled in accordance with ECMA-165).

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. Failure of SS-CO may be indicated to the calling user and the call shall continue in accordance with ECMA-143.

On expiry of timer T1 the Originating PTNX shall enter state CO-Idle. Failure of SS-CO may be indicated to the calling user and the call shall continue in accordance with ECMA-143.

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 ECMA-143, 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 attempt to present the incoming call to the called user again 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. 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 CCITT Progress description no. 8 "in-band information or appropriate pattern now

available", if in-band information is applied to the incoming B channel or if Progress description no. 8 has not been sent earlier in the call.

NOTE 2

The Terminating PTNX can apply in-band information to the incoming B-channel at this stage. However, even if no in-band information 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 CCITT progress description no. 8 to indicate the presence of in-band information.

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 user B 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 user B accepts the waiting call, the Terminating PTNX shall send a CONNECT message and shall enter state CO-Idle.

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

6.6.2.2 Exceptional procedures

Having attempted to present an incoming call to the called user 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 ECMA-143. 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 3

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".

Having attempted to present an incoming call to the called user 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 ECMA-143 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 busy 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 6.6.2 for a Terminating PTNX at which conditions for invocation of SS-CO are not met.

NOTE 4

At the time of publication of this 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 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 Standard and the signalling protocol of the other network.

6.9 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 are possible as a result of different conditions being encountered at the Terminating PTNX. Successive retentions can be for the same supplementary service or for different supplementary services.

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 ECMA-143, shall apply.

Generic procedures for the call related control of supplementary services, as specified in ECMA-165 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 ECMA-143, shall apply.

Generic procedures for the call related control of supplementary services, as specified in ECMA-165 for an End PTNX, shall apply.

A.2.3 Requirements on a Transit PTNX

Call establishment procedures, as specified in ECMA-143, shall apply.

Generic procedures for the call related control of supplementary services, as specified in ECMA-165 for a Transit PTNX, shall apply.

A.3 Path Retention coding requirements

A.3.1 Operations

The operations pathRetain and serviceAvailable as defined in 6.3.1 shall apply. Within the ARGUMENT of operation pathRetain, the element of type ServiceList may contain bits other than those named in 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 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 ECMA-165.

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 ECMA-165. The basic call messages shall be used for call establishment as specified in ECMA-143.

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.

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

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 CCITT 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 A.1

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 ECMA-143.

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 A.2

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 A.3

At the time of publication of this 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 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 60s.

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 Recommendation 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 ECMA-165, 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 ECMA-143, 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 ECMA-143, basic call actions associated with the receipt of that message are deemed to occur.

The following abbreviation is used:

inv.	invoke APDU
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A.9.1 SDL representation of Path Retention at the Originating PTNX

Figure A.9.1 shows the behaviour of a Path Retention entity within the Originating PTNX.

In figure A.9.1 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.

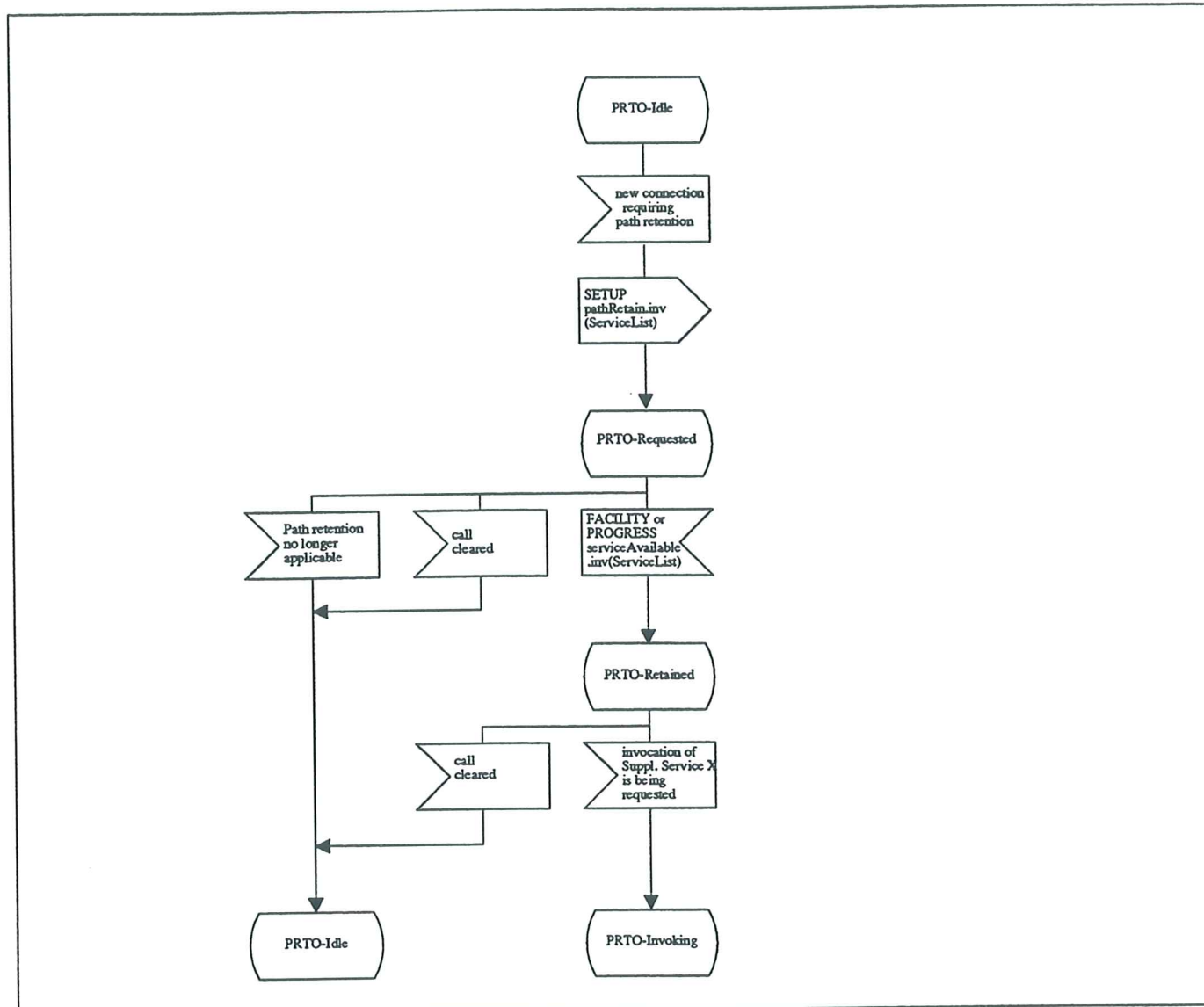


Figure A.9.1 (sheet 1 of 2) - SDL representation of Path Retention at the Originating PTNX

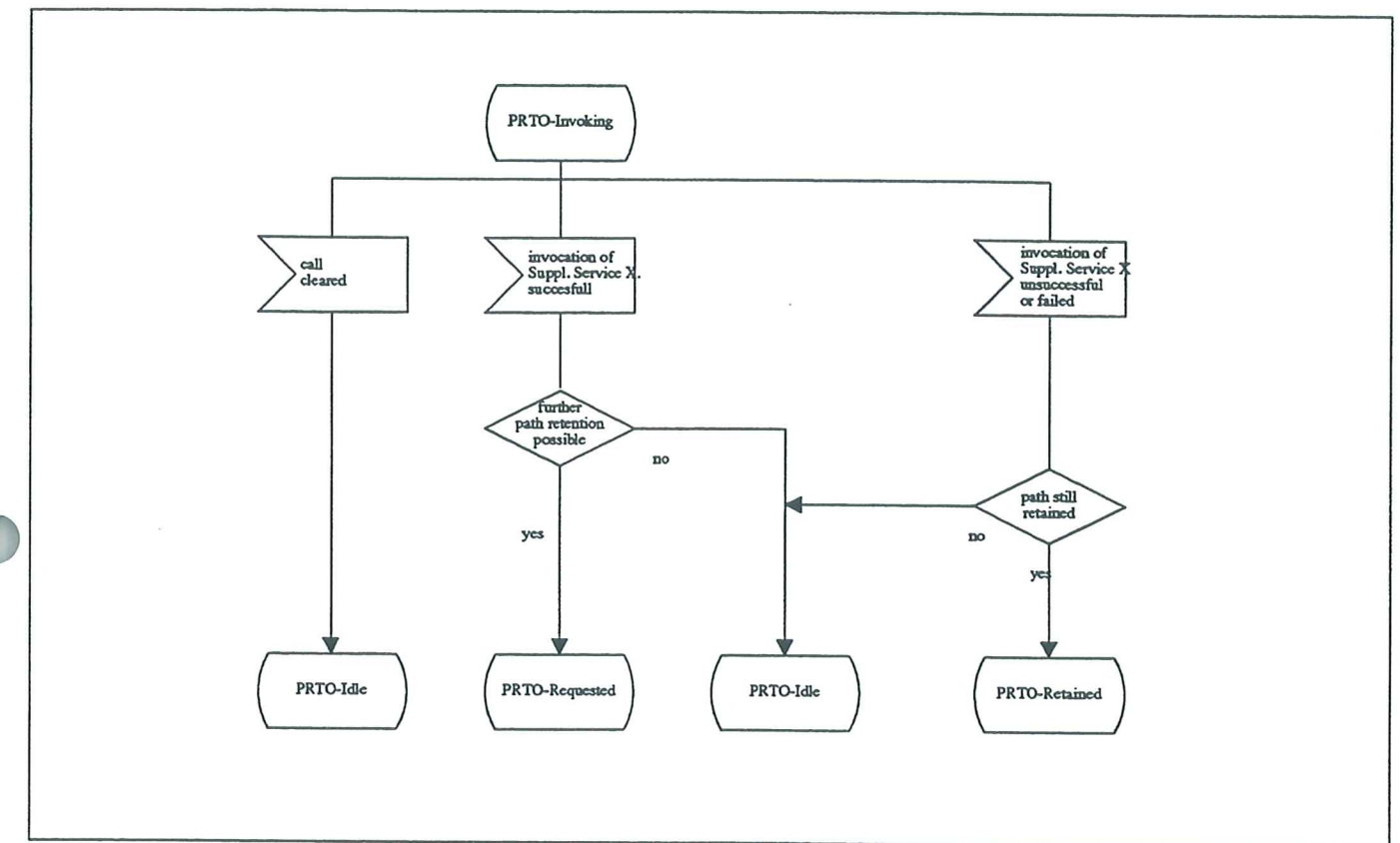


Figure A.9.1 (sheet 2 of 2) - SDL representation of Path Retention at the Originating PTNX

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

Figure A.9.2 shows the behaviour of a Path Retention entity within the Terminating PTNX.

In figure A.9.2 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.

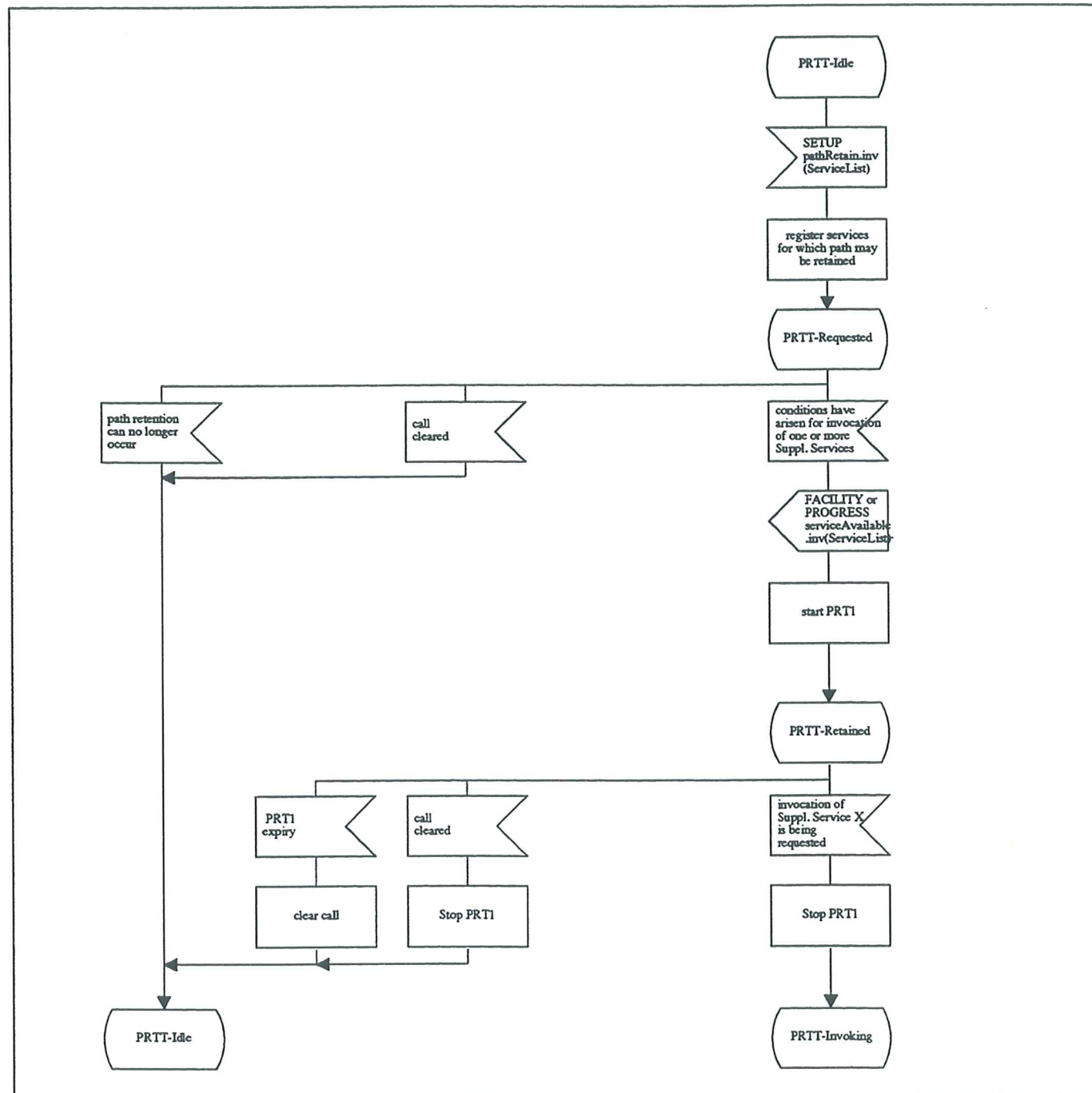


Figure A.9.2 (sheet 1 of 2) - SDL representation of Path Retention at the Terminating PTNX

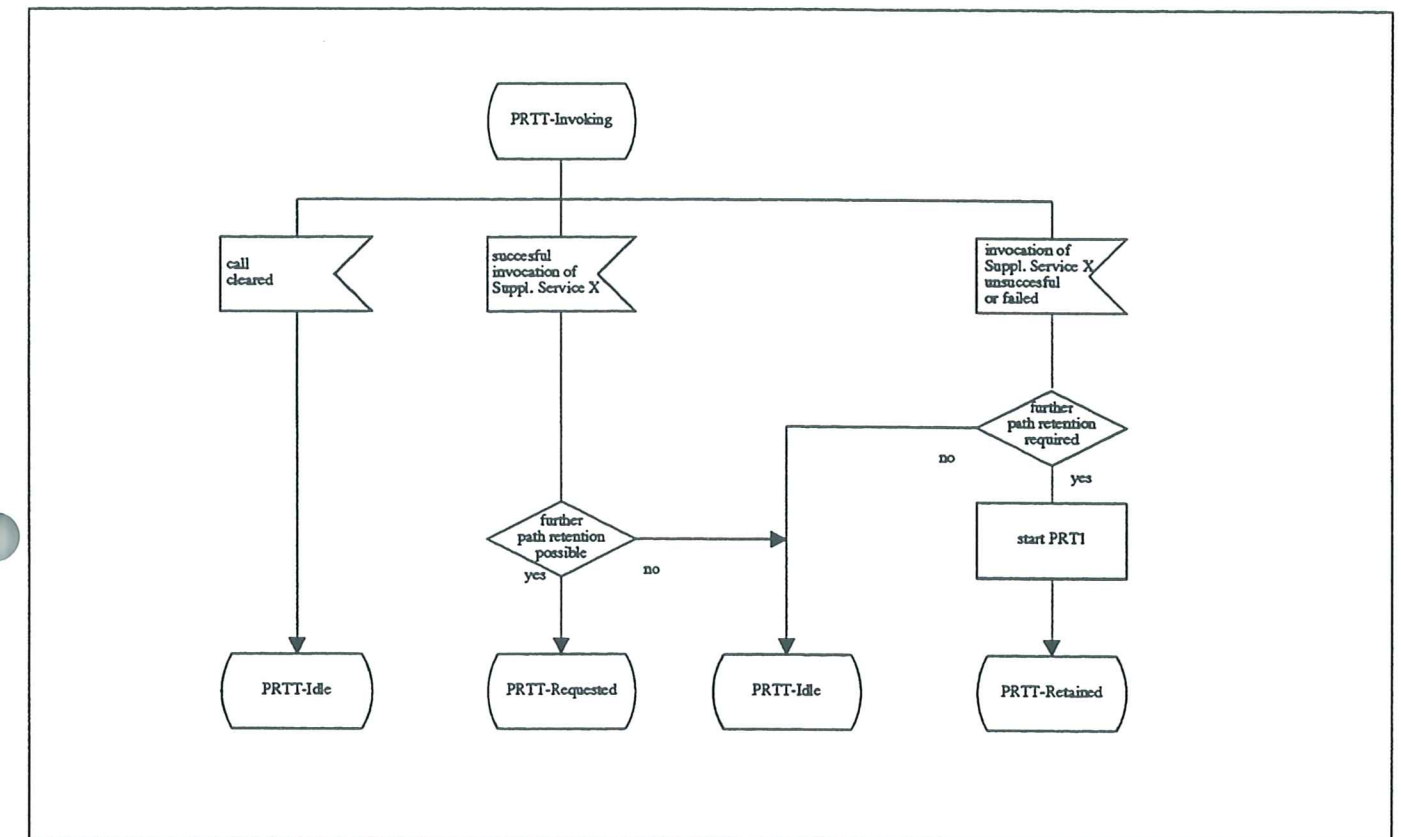


Figure A.9.2 (sheet 2 of 2) - SDL representation of Path Retention at the Terminating PTNX

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 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 suppliers 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 <input type="checkbox"/> Yes <input type="checkbox"/> (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 ECMA-143 and ECMA-165 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	6.9	A1:m	[]	Yes [] Value []
D2	Support of timer PRT1	A.8	A2:m	[]	Yes [] Value []

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

xx.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

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 a ALERTING message.

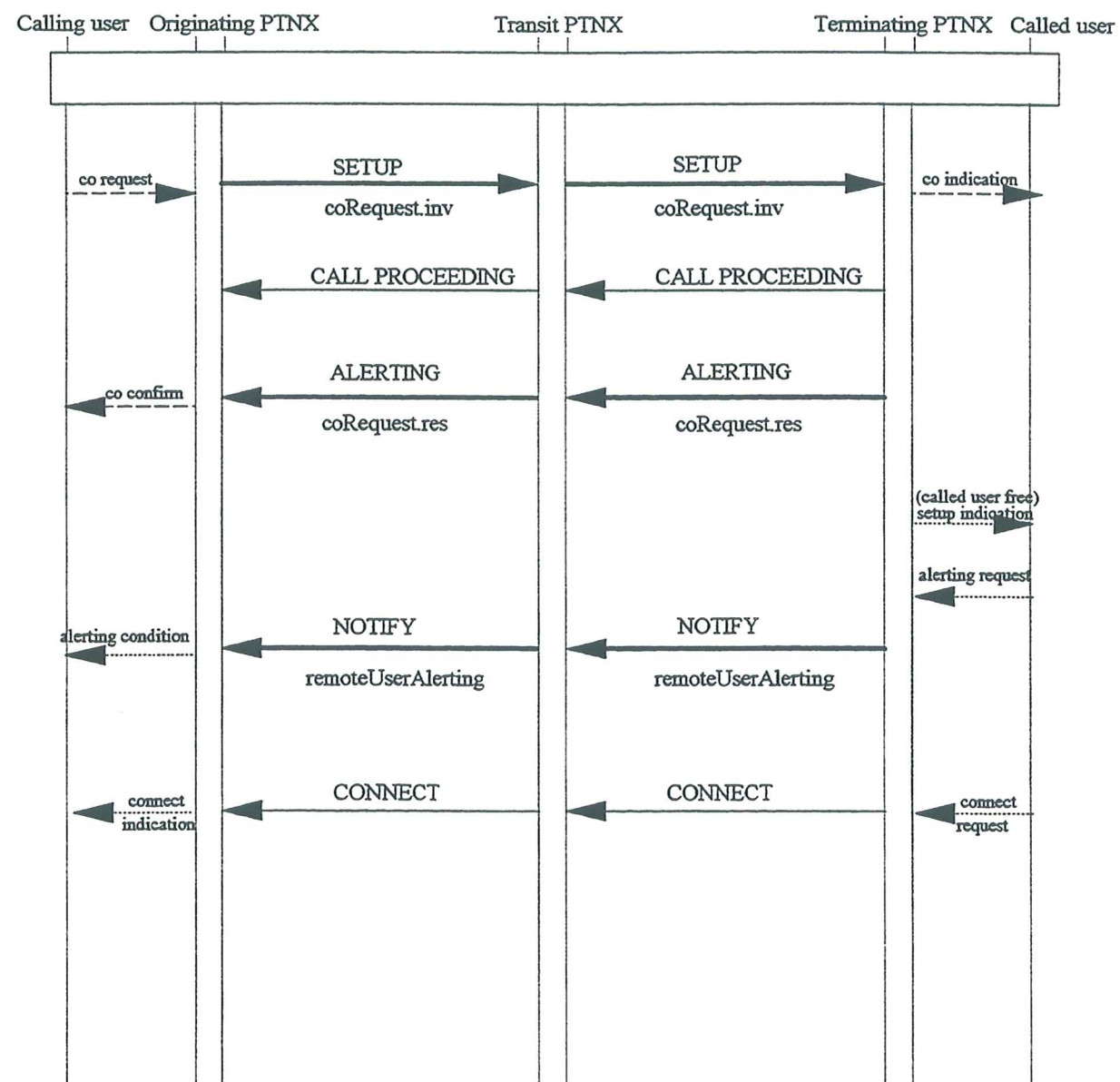


Figure C.1 - Message sequence for normal operation of SS-CO without Path Retention

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.

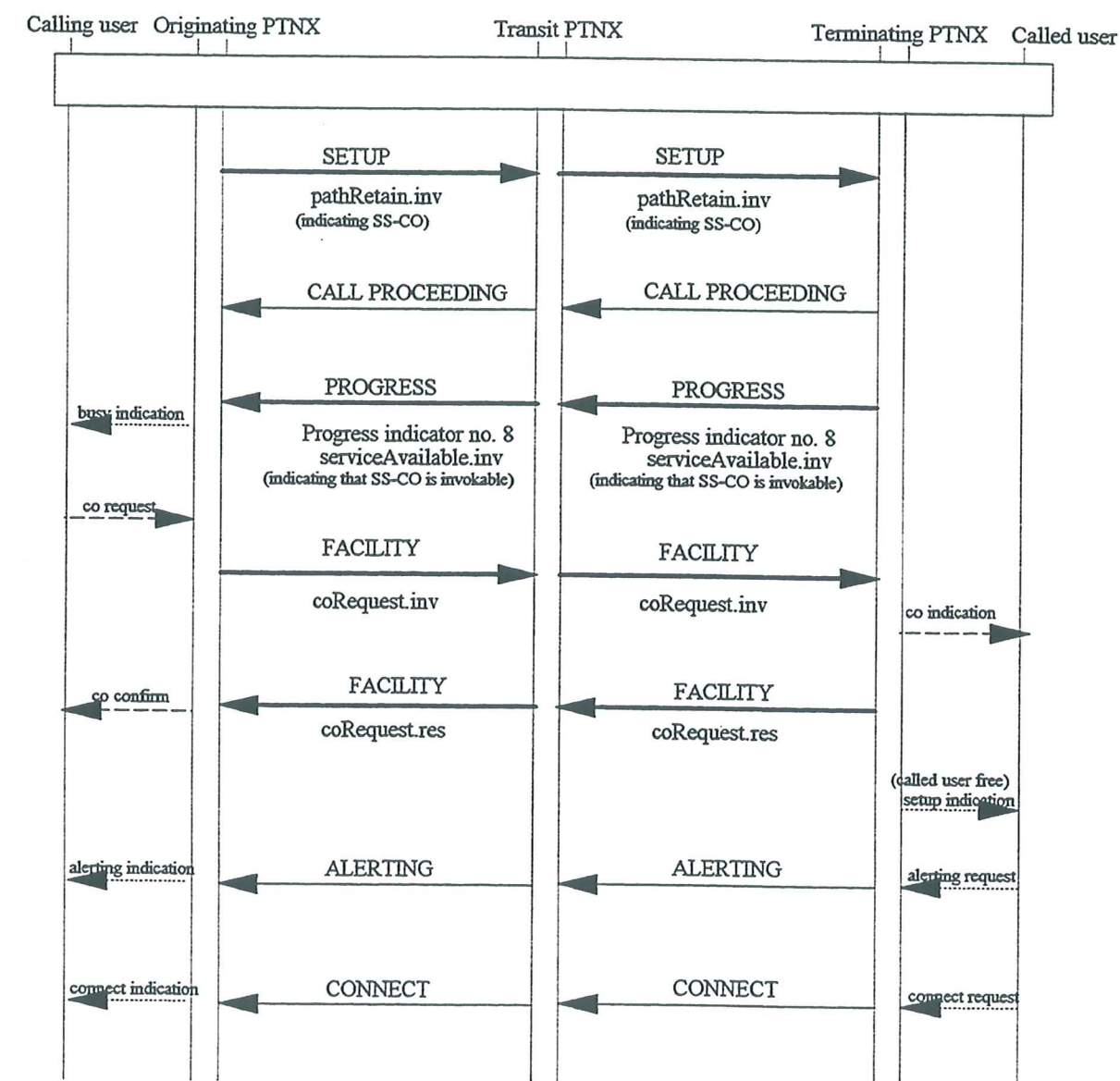


Figure C.2 - Message sequence for normal operation of SS-CO with Path Retention

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.

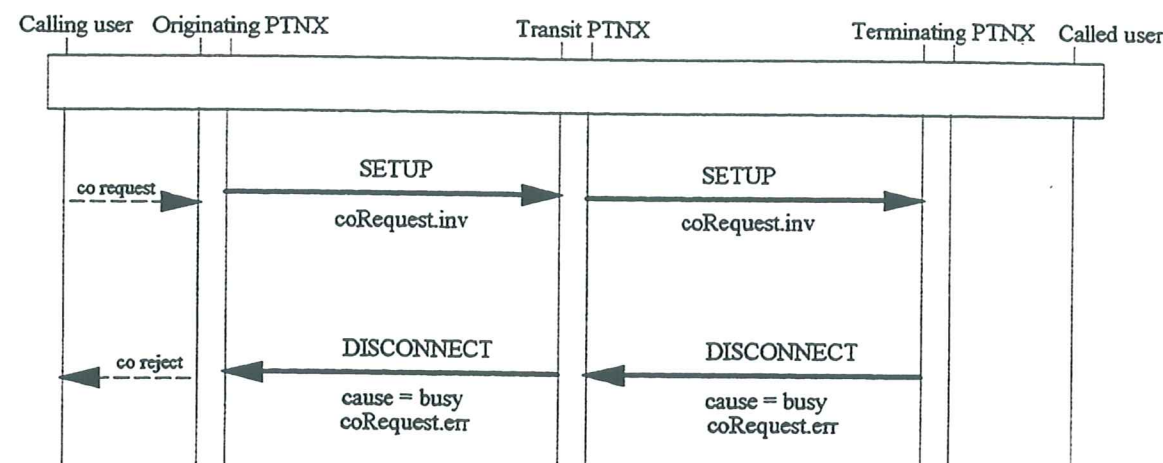


Figure C.3 - Message sequence for unsuccessful invocation of SS-CO

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.

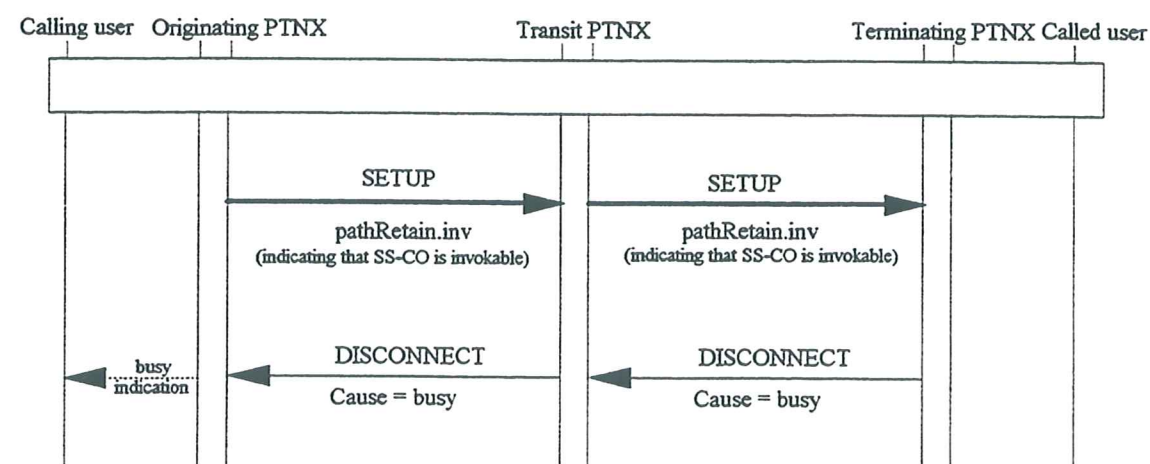


Figure C.4 - Message sequence for unsuccessful invocation of Path Retention for SS-CO

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 Recommendation 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 ECMA-165, the Supplementary Service Control entity uses, via coordination functions, the services of Generic Functional Procedures Control and Basic Call Control.

Where an output symbol represents a primitive to the coordination functions, and that primitive results in a QSIG 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 ECMA-143, basic call actions associated with the sending of that message are deemed to occur.

Where an input symbol represents a primitive from the coordination functions, and that primitive is the result of a QSIG 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 ECMA-143, 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.

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.

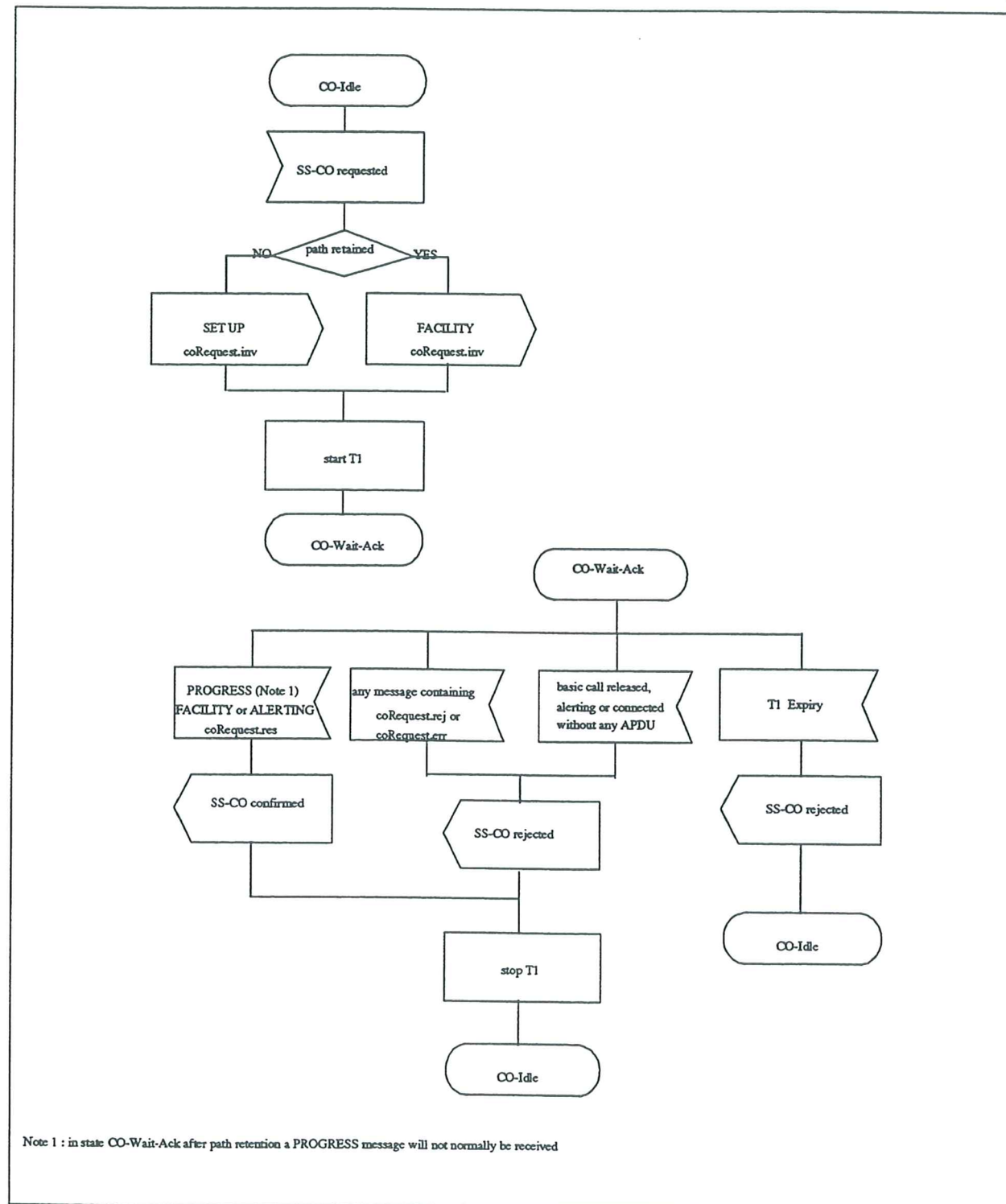


Figure D.1 - Originating PTNX SDL

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.

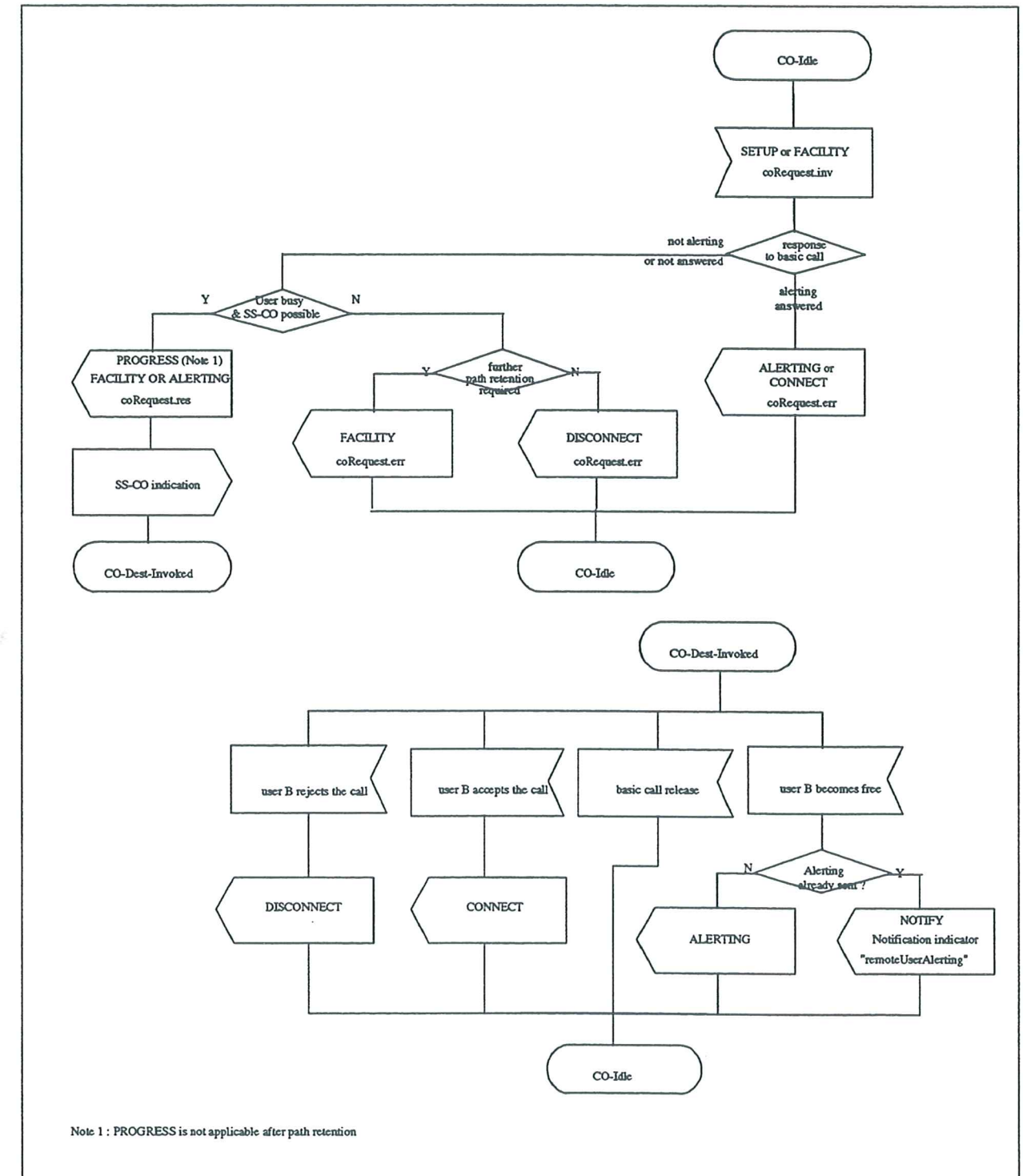


Figure D.2 - Terminating PTNX SDL

