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Contents

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Foreword

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

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

This ETS specifies the signalling protocol for use at the Q reference point in support of the Call Forwarding Unconditional, Call Forwarding Busy, and Call Forwarding No Reply supplementary services.

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

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

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1   Scope

This ETS specifies the signalling protocol for the support of Call Forwarding supplementary services at the Q reference point between Private Telecommunication Network Exchanges (PTNXs) connected together within a Private Telecommunication Network (PTN). The Call Forwarding supplementary services are: Call Forwarding Unconditional (SS-CFU), Call Forwarding Busy (SS-CFB), and Call Forwarding No Reply (SS-CFNR).

SS-CFU, SS-CFB and SS-CFNR are supplementary services which permit a served user to have the PTN send all or specific incoming calls addressed to the served user's PTN number to another number.

The Q reference point is defined in ENV 41004.

Service specifications are produced in three stages and according to the method specified in ENV 41005. This ETS contains the stage 3 specification for the Q reference point and satisfies the requirements identified by the stage 1 and stage 2 specifications in ETS 300 256.

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

The impact on the protocol of interactions between the supplementary services specified in this ETS and other supplementary services is outside the scope of this ETS.

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

2   Conformance

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

3   References

ENV 41004	Reference configuration for connectivity relations of private telecommunication network exchanges (1989).
ENV 41005	Method for the specification of basic and supplementary services of private telecommunication networks (1989).
ENV 41007	Definition of terms in private telecommunication networks (1989).
ETS 300 171	Private Telecommunications Network (PTN); Specification, functional models and information flows; Control aspects of circuit mode basic services (1992).
ETS 300 172	Private Telecommunication Network (PTN); Inter-exchange signalling protocol, Circuit mode basic services (1992).
ETS 300 189	Private Telecommunication Network (PTN); Addressing (1992).
ETS 300 196	ISDN - Generic Functional Protocol for the Support of Supplementary Services - DSS1 Protocol.
ETS 300 238	Private Telecommunication Network (PTN); Signalling between private telecommunication exchanges, Protocol for the support of name identification supplementary services (1993).
ETS 300 239	Private Telecommunication Network (PTN); Signalling between private telecommunication exchanges, Generic functional protocol for the support of supplementary services (1993).

ETS 300 256	Private Telecommunication Networks (PTN); Specification, Functional Model and Information Flows, Diversion Supplementary Services (1993).
prETS 300 207	Integrated Services Digital Network (ISDN) Diversion supplementary services Digital Subscriber Signalling No. one (DSS1) protocol.
CCITT Recommendation I.112	Vocabulary of terms for ISDNs (1988).
CCITT Recommendation I.210 an ISDN and (1988).	Principles of telecommunication services supported by the means to describe them
CCITT Recommendation I.221	Common specific characteristics of services (1988).
CCITT Recommendation Z.100	Specification and description language (1988).

4 Definitions

For the purpose of this ETS the following definitions apply.

4.1 External definitions

This ETS uses the following terms defined in other documents:

- Application Protocol Data Unit (ETS 300 239)
- Basic Service (CCITT Recommendation I.210)
- Call, Basic Call (ETS 300 239)
- Co-ordination Function (ETS 300 239)
- End PTNX (ETS 300 239)
- Incoming Gateway PTNX (ETS 300 172)
- Integrated Services Digital Network (CCITT Recommendation I.112)
- Interpretation APDU (ETS 300 239)
- Network determined user busy (CCITT Recommendation I.221)
- Notification (ETS 300 239)
- NFE (ETS 300 239)
- Originating PTNX (ETS 300 172)
- Outgoing Gateway PTNX (ETS 300 172)
- Private (ENV 41007)
- Private Telecommunication Network Exchange (ENV 41007)
- PTN number (ETS 300 189)
- Public ISDN (ENV 41007)
- Signalling (CCITT Recommendation I.112)
- Supplementary Service (CCITT Recommendation I.210)
- Supplementary Service Control Entity (ETS 300 239)
- Telecommunication Network (ENV 41007)
- Terminal, Terminal Equipment (ENV 41007)
- Terminating PTNX (ETS 300 172)
- Transit PTNX (ETS 300 172)
- User (ETS 300 171)
- User determined user busy (CCITT Recommendation I.221)

4.2 Activating PTNX

The PTNX serving the activating user.

4.3 Busy

An ISDN destination is considered to be busy if either a "network determined user busy" or a "user determined user busy" condition exists.

4.4   Connected number

The number of the user that answers (user C).

4.5   Deactivating PTNX

The PTNX serving the deactivating user.

4.6   Diversion

The redirection of a call, on request of a called user and prior to answer, to a number different from the number of that called user.

4.7   Diverted-to number

The number to which a call is diverted.

4.8   Diverted-to PTNX

The PTNX serving the diverted-to user.

4.9   Diverted-to user

The user to which a call is diverted.

4.10   Diverting cause

The parameter which contains the reason for the diversion, e.g. CFU, CFB, CFNR.

4.11   Diverting number

The number of the served user.

4.12   Forwarding

The type of diversion invoked automatically by the network in accordance with information previously registered in the network against the called number.

NOTE 1

Forwarding can occur as a result of the supplementary services specified in this ETS (CFU, CFB, CFNR). Diversions of types other than forwarding (e.g. Call Deflection, whereby the diversion is invoked by action of the called user) are outside the scope of this edition of this ETS.

4.13   Forward switching

Network routing algorithm which performs the diversion by joining together the first connection from user A's node to user B's node and a second, new connection from user B's node to user C's node.

4.14   Interrogating PTNX

The PTNX serving the interrogating user.

4.15   Last diverting user

The served user from the point of view of the diverted-to user for a particular stage of call diversion. In the case of a call subject to a single stage of call diversion, user B is the last diverting user from the point of view of user C. In the case of a call subject to multiple stages of call diversion, user B1 is the last diverting user from the point of view of user B2, user B2 is the

last diverting user from the point of view of user B3, etc. The served user for the final stage of call diversion is the last diverting user from the point of view of user C.

4.16 Original called number

The number of user B (in case of multiple call diversion user B1).

4.17 Original called user

The first served user of a call which is subject to one or more stages of call diversion, i.e. user B or user B1.

4.18 Partial re-routing

Network routing algorithm which performs the call diversion by replacing a particular part of the connection from user A's node (located in the public ISDN) to user B's node (located in a private ISDN) by another connection from user A's node to user C's node (located in the public ISDN). The new connection is established completely within the public ISDN by joining together the original connection from user A's node to the public ISDN gateway node and a second, new connection from the public ISDN gateway node to user C's node.

NOTE 2

Re-routing by a Transit PTNX is not considered as partial re-routing.

4.19 Presentation indicator

The indicator showing whether the diverted-to number should be presented to the calling user, as derived from user C's COLR supplementary service.

4.20 Re-routing

Network routing algorithm which performs the call diversion by replacing the connection from user A's node to user B's node by another connection, possibly using some of the elements of the old connection, from user A's node to user C's node.

4.21 Re-routing PTNX

The PTNX which executes call diversion.

NOTE 3

In case of re-routing, the Re-routing PTNX is either the Originating PTNX or the Incoming Gateway PTNX. In case of forward switching, the Re-routing PTNX is the Terminating PTNX.

4.22 Served user

The user of a particular PTN number who is requesting that calls to his number be diverted. This user may also be referred to as the diverting user or the called user.

4.23 User A

The calling user of a call which is subject to call diversion.

4.24 User B

The served (diverting) user of a call which is subject to call diversion.

4.25 User B1, user B2, user B3, etc.

Served (diverting) users of a call which is subject to multiple stages of diversion. B1 is the first served user, B2 is the second served user, B3 is the third served user, etc.

NOTE 4

B2 is also the diverted-to user with respect to the first stage of call diversion, B3 is also the diverted-to user with respect to the second stage of call diversion, etc.

4.26 User C

The diverted-to user with respect to the final stage of call diversion.

5 List of acronyms

APDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation One
SS-CLIR	Calling/Connected Line Identification Restriction supplementary service
SS-CNIP	Calling Name Identification Presentation supplementary service
SS-CNIR	Calling/Connected Name Identification Restriction supplementary service
ISDN	Integrated Services Digital Network
NDUB	Network Determined User Busy
NFE	Network Facility Extension
PICS	Protocol Implementation Conformance Statement
PTN	Private Telecommunication Network
PTNX	Private Telecommunication Network Exchange
SDL	Specification and Description Language
SS-CF	Call Forwarding supplementary service
SS-CFB	Call Forwarding Busy supplementary service
SS-CFNR	Call Forwarding No Reply supplementary service
SS-CFU	Call Forwarding Unconditional supplementary service
TE	Terminal Equipment
UDUB	User Determined User Busy

6 Signalling protocol for the support of SS-CF

6.1 SS-CF description

SS-CFU enables a served user to have the PTN redirect to another user calls which are addressed to the served user's PTN number. SS-CFU may operate on all calls, or just those associated with specified basic services. The served user's ability to originate calls is unaffected by SS-CFU. After SS-CFU has been activated, calls are forwarded independently of the status of the served user.

SS-CFB enables a served user to have the PTN redirect to another user calls which are addressed to the served user's PTN number and meet busy. SS-CFB may operate on all calls, or just those associated with specified basic services. The served user's ability to originate calls is unaffected by SS-CFB.

SS-CFNR enables a served user to have the PTN redirect to another user calls which are addressed to the served user's PTN number and for which the connection is not established within a defined period of time. SS-CFNR may operate on all calls, or just those associated with specified basic services. The served user's ability to originate calls is unaffected by SS-CFNR.

The maximum number of diversions to a single call is an implementation option. When counting the number of diversions, all types of diversions shall be included.

SS-CFU, SS-CFB and SS-CFNR are applicable to all basic services defined in ETS 300 171.

6.2 SS-CF operational requirements

6.2.1 Provision/withdrawal

Provision and withdrawal shall be in accordance with 6.2.1, 7.2.1 and 8.2.1 of ETS 300 256.

Subscription options that have an impact on the signalling protocol at the Q reference point are summarised in table 1 below.

Table 1 - Subscription options

Subscription Parameter	Value
* Calling user receives notification that call has been diverted	- No - Yes, without diverted-to number/name - Yes, with diverted-to number/name
* Served user releases his/her number/name to diverted-to user	- No - Yes

The subscription parameters and values offered by a PTNX are an implementation matter. A PTNX may offer more or less parameters and values than those specified in this clause.

6.2.2 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. In addition, the generic procedures for notification, as specified in ETS 300 239 for an End PTNX, shall apply.

6.2.3 Requirements on the Served User PTNX

Call establishment 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.

Generic procedures for the call independent control (connection oriented) of supplementary services, as specified in ETS 300 239 for a Terminating PTNX, shall apply if the remote activation, deactivation or interrogation procedure is supported.

Generic procedures for the call independent control (connection oriented) of supplementary services, as specified in ETS 300 239 for an Originating PTNX, shall apply if the procedure for verification of the diverted-to number is supported.

6.2.4 Requirements on the Diverted-to PTNX

Call establishment 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.

Generic procedures for the call independent control (connection oriented) of supplementary services, as specified in ETS 300 239 for a Terminating PTNX, shall apply if the procedure for verification of the diverted-to number is supported.

6.2.5 Requirements on the Re-routing PTNX

Call establishment for the outgoing and 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.

6.2.6 Requirements on a Transit PTNX

Basic call procedures for call establishment and call clearing at a Transit PTNX, as specified in ETS 300 172, shall apply.

Generic procedures for the call related control and call independent control (connection oriented) of supplementary services, as specified in ETS 300 239 for a Transit PTNX, shall apply. In addition, the generic procedures for notification, as specified in ETS 300 239 for a Transit PTNX, shall apply.

6.2.7 Requirements on the Activating PTNX

Generic procedures for the call independent control (connection oriented) of supplementary services, as specified in ETS 300 239 for an Originating PTNX, shall apply.

6.2.8 Requirements on the Deactivating PTNX

Generic procedures for the call independent control (connection oriented) of supplementary services, as specified in ETS 300 239 for an Originating PTNX, shall apply.

6.2.9 Requirements on the Interrogating PTNX

Generic procedures for the call independent control (connection oriented) of supplementary services, as specified in ETS 300 239 for an Originating PTNX, shall apply.

6.3 SS-CF coding requirements

6.3.1 Operations

The operations defined in Abstract Syntax Notation One (ASN.1) in table 2 shall apply.

Table 2 - Operations in Support of SS-CF (sheet 1 of 5)

Call-Forwarding-Operations
      { ccitt (0) identified-organization (3) etsi (0) qsig-forwarding (257)
        call-forwarding-operations (0) }

DEFINITIONS EXPLICIT TAGS ::=

BEGIN

IMPORTS   OPERATION, ERROR FROM Remote-Operation-Notation
               { joint-iso-ccitt (2) remote-operations (4) notation (0) }

              Extension FROM Manufacturer-specific-service-extension-definition
               { ccitt (0) identified-organization (3) etsi (0)
                    qsig-generic-procedures (239) msi-definition (0) }

              QSIGInformationElement FROM Generic-parameters-definition
               { ccitt (0) identified-organization (3) etsi (0)
                    qsig-generic-procedures (239) qsig-generic-parameters (6) }

              Name, NameSet FROM Name-Operations
               { ccitt (0) identified-organization (3) etsi (0)
                    qsig-name (238) name-operations (0) }

              basicServiceNotProvided, invalidServedUserNr, notAvailable, notSubscribed,
              resourceUnavailable, supplementaryServiceInteractionNotAllowed
              FROM General-Errors
               { ccitt (0) identified-organization (3) etsi (0) 196 general-errors (2) }

              Address, PartyNumber, PartySubaddress, PresentationAllowedIndicator,
              PresentedNumberScreened, PresentedNumberUnscreened
              FROM Addressing-Data-Elements
               { ccitt (0) identified-organization (3) etsi (0) 196
                   addressing-data-elements (6) }

              BasicService FROM Basic-Service-Elements
               { ccitt (0) identified-organization (3) etsi (0) 196
                   basic-service-elements (8) }

              diversionToServedUserNr, invalidDivertedToNr, specialServiceNr,
              numberOfDiversionsExceeded FROM Diversion-Operations
               { ccitt (0) identified-organization (3) etsi (0) 207
                   operations-and errors (1) };

Table 2 - Operations in Support of SS-CF (sheet 2 of 5)

```
ActivateDiversionQ          OPERATION
      - - Sent from the Activating PTNX to the Served User PTNX
          ARGUMENT  SEQUENCE
                  {       procedure               Procedure,
                          basicService            BasicService,
                          divertedToAddress       Address,
                          servedUserNr            PartyNumber,
                          activatingUserNr        PartyNumber,
                          extension               CHOICE {
                                  [1] IMPLICIT Extension,
                                  [2] IMPLICIT SEQUENCE OF Extension  } OPTIONAL  }
          RESULT      CHOICE  {
                          NULL,
                          [1] IMPLICIT Extension,
                          [2] IMPLICIT SEQUENCE OF Extension  }
          ERRORS     {  notSubscribed, notAvailable, invalidServedUserNr,
                          basicServiceNotProvided, resourceUnavailable, invalidDivertedToNr,
                          specialServiceNr, diversionToServedUserNr, temporarilyUnavailable,
                          notAuthorized, unspecified  }


DeactivateDiversionQ OPERATION
        - - Sent from the Deactivating PTNX to the Served User PTNX
          ARGUMENT  SEQUENCE
                  {       procedure               Procedure,
                          basicService            BasicService,
                          servedUserNr            PartyNumber,
                          deactivatingUserNr      PartyNumber,
                          extension               CHOICE {
                                  [1] IMPLICIT Extension,
                                  [2] IMPLICIT SEQUENCE OF Extension  } OPTIONAL  }
          RESULT       CHOICE  {
                          NULL,
                          [1] IMPLICIT Extension,
                          [2] IMPLICIT SEQUENCE OF Extension  }
          ERRORS      {     notSubscribed, notAvailable, invalidServedUserNr,
                          temporarilyUnavailable, notAuthorized, unspecified  }


InterrogateDiversionQ OPERATION
        - - Sent from the Interrogating PTNX to the Served User PTNX
          ARGUMENT  SEQUENCE
                  {       procedure               Procedure,
                          basicService            BasicService DEFAULT allServices,
                          servedUserNr            PartyNumber,
                          interrogatingUserNr     PartyNumber,
                          extension               CHOICE {
                                  [1] IMPLICIT Extension,
                                  [2] IMPLICIT SEQUENCE OF Extension  } OPTIONAL  }
          RESULT      IntResultList
          ERRORS      {     notSubscribed, notAvailable, invalidServedUserNr,
                          temporarilyUnavailable, notAuthorized, unspecified  }
```

Table 2 - Operations in Support of SS-CF (sheet 3 of 5)

```
CheckRestriction            OPERATION
      -- Sent from the Served User PTNX to the Diverted-to PTNX
         ARGUMENT  SEQUENCE
                {       servedUserNr            PartyNumber,
                        basicService            BasicService,
                        divertedToNr            PartyNumber,
                        extension               CHOICE {
                                [1] IMPLICIT Extension,
                                [2] IMPLICIT SEQUENCE OF Extension } OPTIONAL }
         RESULT     CHOICE {
                                NULL,
                                [1] IMPLICIT Extension,
                                [2] IMPLICIT SEQUENCE OF Extension }
         ERRORS     {       notAvailable, invalidServedUserNr,
                            invalidDivertedToNr, specialServiceNr, unspecified }


CallRerouting           OPERATION
      - - Sent from the Served User PTNX to the Re-routing PTNX
         ARGUMENT  SEQUENCE
                {       reroutingReason             DiversionReason,
                        calledAddress               Address,
                        diversionCounter            INTEGER (1..15),
                        qSIGInfoElement             QSIGInformationElement,
      - - The basic call information elements Bearer capability, High layer compatibility, Low
      - - layer compatibility, Progress indicator and Party Category can be embedded in the
      - - qSIGInfoElement in accordance with clause 6.5.3.1.5.
                        lastReroutingNr         [1] PresentedNumberUnscreened,
                        subscriptionOption          [2] IMPLICIT SubscriptionOption,
                        callingPartySubaddress [3] PartySubaddress OPTIONAL,
                        callingNumber               [4] PresentedNumberScreened,
                        callingName                 [5] Name OPTIONAL,
                        originalCalledNr        [6] PresentedNumberUnscreened OPTIONAL,
                        redirectingName             [7] IMPLICIT NameSet OPTIONAL,
                        originalCalledName          [8] IMPLICIT NameSet OPTIONAL,
                        extension                       CHOICE {
                                [9] IMPLICIT Extension,
                                [10] IMPLICIT SEQUENCE OF Extension } OPTIONAL }
         RESULT      CHOICE {
                                NULL,
                                [1] IMPLICIT Extension,
                                [2] IMPLICIT SEQUENCE OF Extension }
         ERRORS     {       notSubscribed, notAvailable,
                            resourceUnavailable, invalidDivertedToNr, specialServiceNr,
                            diversionToServedUserNr, numberOfDiversionsExceeded,
                            unspecified, supplementaryServiceInteractionNotAllowed }
      - - The error value numberOfDiversionsExceeded applies only in case of partial
      - - re-routing.
```

Table 2 - Operations in Support of SS-CF (sheet 4 of 5)

```
DivertingLegInformation1            OPERATION
    - - Sent from the Re-routing PTNX to the Originating PTNX
        ARGUMENT  SEQUENCE
            {       diversionReason                 DiversionReason,
                    subscriptionOption              SubscriptionOption,
                    nominatedNr                     PresentedNumberUnscreened,
                    extension                       CHOICE {
                        [3] IMPLICIT Extension,
                        [4] IMPLICIT SEQUENCE OF Extension  } OPTIONAL  }

DivertingLegInformation2            OPERATION
    - - Sent from the Re-routing PTNX to the Diverted-to PTNX
        ARGUMENT  SEQUENCE
            {       diversionCounter                INTEGER (1..15),
                    diversionReason                 DiversionReason,
                    divertingNr             [1] PresentedNumberUnscreened OPTIONAL,
    - - this element is mandatory except in interworking cases
                    originalCalledNr        [2] PresentedNumberUnscreened OPTIONAL,
                    redirectingName             [3] IMPLICIT NameSet OPTIONAL,
                    originalCalledName          [4] IMPLICIT NameSet OPTIONAL,
                    extension                       CHOICE {
                        [5] IMPLICIT Extension,
                        [6] IMPLICIT SEQUENCE OF Extension  } OPTIONAL  }

DivertingLegInformation3            OPERATION
    - - Sent from the Diverted-to PTNX to the Originating PTNX
        ARGUMENT  SEQUENCE
            {       presentationAllowedIndicator    PresentationAllowedIndicator,
                    redirectionName             [0] IMPLICIT NameSet OPTIONAL,
                    extension                       CHOICE {
                        [1] IMPLICIT Extension,
                        [2] IMPLICIT SEQUENCE OF Extension  } OPTIONAL  }

CfnrDivertedLegFailed           OPERATION
    - - Sent from the Re-routing PTNX to the Served User PTNX
        ARGUMENT     CHOICE {
                        NULL,
                        [1] IMPLICIT Extension,
                        [2] IMPLICIT SEQUENCE OF Extension  }
    - - This indicates that the diverted-to leg has been cleared during SS-CFNR execution.
```

Table 2 - Operations in Support of SS-CF (sheet 5 of 5)

```
- - Definitions of general used data types:

DiversionReason        ::= ENUMERATED      { unknown (0), cfu (1), cfb (2), cfnr (3),
                            cd (4),              - - reserved for further editions of this ETS
                            cdImmediate (5)  }   - - reserved for further editions of this ETS
        - - value unknown shall be used only when a corresponding value has been received from
        - - from another network when  interworking
IntResultList     ::= SET SIZE (0..29) OF IntResult
IntResult         ::= SEQUENCE
                         {      servedUserNr        PartyNumber,
                                basicService        BasicService,
                                procedure           Procedure,
                                divertedToAddress   Address,
                                remoteEnabled       BOOLEAN DEFAULT FALSE,
                                extension           CHOICE  {
                                   [1] IMPLICIT Extension,
                                   [2] IMPLICIT SEQUENCE OF Extension  } OPTIONAL  }


Procedure      ::= ENUMERATED  { cfu (0), cfb (1), cfnr (2)  }

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



SubscriptionOption     ::= ENUMERATED  {
                            noNotification (0),
                            notificationWithoutDivertedToNr (1),
                            notificationWithDivertedToNr (2)  }

activateDiversionQ            ActivateDiversionQ              ::= { ptn activateDiversionQ (15) }
deactivateDiversionQ          DeactivateDiversionQ            ::= { ptn deactivateDiversionQ (16) }
interrogateDiversionQ         InterrogateDiversionQ           ::= { ptn interrogateDiversionQ (17) }
checkRestriction              CheckRestriction                ::= { ptn checkRestriction (18) }
callRerouting                 CallRerouting                   ::= { ptn callRerouting (19) }
divertingLegInformation1      DivertingLegInformation1        ::= { ptn divertingLegInformation1 (20) }
divertingLegInformation2      DivertingLegInformation2        ::= { ptn divertingLegInformation2 (21) }
divertingLeginformation3      DivertingLegInformation3        ::= { ptn divertingLegInformation3 (22) }
cfnrDivertedLegFailed         CfnrDivertedLegFailed           ::= { ptn cfnrDivertedLegFailed (23) }

temporarilyUnavailable               ERROR::= { ptn 1000 }
notAuthorized                        ERROR::= { ptn 1007 }
unspecified     Unspecified                     ::= { ptn 1008 }

Unspecified                          ERROR   PARAMETER   Extension



END - - of Call-Forwarding-Operations
```

6.3.2 Information elements

6.3.2.1 Facility information element

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

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

When conveying the invoke APDU of the operations divertingLegInformation1, divertingLegInformation2, divertingLegInformation3 or cfnrDivertedLegFailed, the interpretation APDU shall be included and shall contain value discardAnyUnrecognisedInvokePdu. In all other cases, the interpretation APDU shall be omitted.

6.3.2.2 Notification indicator information element

The general structure and coding of the Notification indicator information element is specified in 11.3.4 of ETS 300 239.

The following specific Notification Description value shall be used for the diversion notification from the Outgoing Gateway PTNX to the Originating PTNX as received from the public ISDN:

- call is diverting: "111 1011" (Bits 765 4321).

The Redirection number information element received from the public ISDN and sent by the Outgoing Gateway PTNX to the Originating PTNX shall be included in an element of type QSIGInformationElement in the argument of notification qsigIeNotification (as defined in table 26 of 11.3.3.4 of ETS 300 239) within a second Notification indicator information element. The following Notification Description value shall be used for this purpose:

- discriminator for notification extension: "000 0011" (Bits 765 4321).

The Redirection number information element shall be encoded as specified in prETS 300 207.

6.3.3 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. The basic call messages shall be used for call establishment and release as specified in ETS 300 172.

6.4 SS-CF 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-CF Supplementary Service Control entity in that PTNX in association with a particular call:

. CFO-Idle: No divertingLegInformation1 invoke APDU has been received.

. CFO-Divert: The divertingLegInformation1 invoke APDU has been received and the subscription option of the served user and the diverted-to number have been stored.

6.4.2   States at the Served User PTNX

The procedures for the Served User PTNX are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity. There are different state machines for activation, deactivation, interrogation and invocation of call diversion:

Activation states (in association with a particular request for activation):

.   CFS-Act-Idle: No processing of an activateDiversionQ invoke APDU;

.   CFS-Act-Wait: The Served User PTNX has received an activation request and has sent a checkRestriction invoke APDU to the Diverted-to PTNX.

Deactivation state (in association with a particular request for deactivation):

.   CFS-Deact-Idle: No processing of a deactivateDiversionQ invoke APDU;

Interrogation state (in association with a particular request for interrogation):

.   CFS-Inter-Idle: No processing of an interrogateDiversionQ invoke APDU.

Invocation states (in association with a particular call):

.   CFS-Inv-Idle: Diversion invocation not in progress;

.   CFS-Requested: The Served User PTNX has sent a callRerouting invoke APDU to the Re-routing PTNX and is waiting for receipt of a return result, return error or reject APDU.

6.4.3   States at the Diverted-to PTNX

The procedures for the Diverted-to PTNX are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity in that PTNX. There are different state machines for the invocation of call diversion and restriction checking:

Invocation states (in association with a particular call):

.   CFF-Inv-Idle: No processing of a divertingLegInformation2 invoke APDU;

.   CFF-Inv-Wait: A divertingLegInformation2 invoke APDU has been received and the Diverted-to PTNX is waiting for valid presentation restriction information.

Check restriction state (in association with a particular request for validating a diverted-to number):

.   CFF-Res-Idle: No processing of a checkRestriction invoke APDU.

6.4.4   States at the Re-routing PTNX

The procedures for the Re-routing PTNX are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity in that PTNX in association with a particular call:

.   CFR-Idle: Re-routing not in progress;

.   CFR-Invoked: The CFNR re-routing procedure has been successfully performed and the Re-routing PTNX is waiting for completion of establishment of the call to the diverted-to user.

6.4.5 States at the Activating PTNX

The procedures for the Activating PTNX are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity in that PTNX:

- CFA-Idle: Activation not in progress;

- CFA-Wait: An activateDiversionQ invoke APDU has been sent. The Activating PTNX is waiting for the response.

6.4.6 States at the Deactivating PTNX

The procedures for the Deactivating PTNX are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity in that PTNX:

- CFD-Idle: Deactivation not in progress;

- CFD-Wait: A deactivateDiversionQ invoke APDU has been sent. The Deactivating PTNX is waiting for the response.

6.4.7 States at the Interrogating PTNX

The procedures for the Interrogating PTNX are written in terms of the following conceptual states existing within the SS-CF Supplementary Service Control entity in that PTNX:

- CFI-Idle: Interrogation not in progress;

- CFI-Wait: An interrogateDiversionQ invoke APDU has been sent. The Interrogating PTNX is waiting for the response.

6.5 SS-CF signalling procedures

Annex B shows some examples of message sequences of the signalling procedures.

6.5.1 Actions at the Originating PTNX

When an Originating PTNX also provides Re-routing PTNX functionality, in support of call diversion by re-routing, the joint requirements of 6.5.1 (for an Originating PTNX) and 6.5.4 (for a Re-routing PTNX) shall apply, with the exception that any communication between the Originating PTNX functionality and the Re-routing PTNX functionality will be an intra-PTNX matter. The messages specified for sending from the Originating PTNX towards the Re-routing PTNX or vice versa will not appear on any inter-PTNX link.

NOTE 5

The Originating PTNX can act also as Re-routing PTNX in all cases where call diversion by re-routing is appropriate.

6.5.1.1 Normal procedure

On receipt of a divertingLegInformation1 invoke APDU in a FACILITY or CONNECT message while in basic call protocol control state Overlap Sending, Outgoing Call Proceeding or Call Delivered and in state CFO-Idle, the Originating PTNX shall take account of the information therein and enter state CFO-Divert. In determining whether to notify the calling user, the Originating PTNX shall take account of the value of element subscriptionOption. If the value noNotification has been received, no notification of diversion shall be given to the calling user. Otherwise a notification of diversion shall be given to the calling user if the capability exists. The diverted-to number and subaddress shall not be presented to the calling user at this stage. When the APDU has been received in a CONNECT message, a divertingLegInformation3 invoke APDU in the same message shall be handled as specified below.

On receipt of a divertingLegInformation1 invoke APDU in a FACILITY or CONNECT message while in state CFO-Divert, the Originating PTNX shall take account of the information therein and remain in the same state. If the value of element diversionReason is not cfnr, no notification of this further diversion shall be given to the calling user. If the value of element diversionReason is cfnr, account shall be taken of the value of element subscriptionOption in this APDU and in all previously received divertingLegInformation1 invoke APDUs for this call. If this or any previous value is noNotification, no notification shall be given to the calling user. Otherwise a notification of further diversion shall be given to the calling user if the capability exists. The diverted-to number and subaddress shall not be presented to the calling user at this stage. When the APDU has been received in a CONNECT message, a divertingLegInformation3 invoke APDU in the same message shall be handled as specified below.

On receipt of a divertingLegInformation3 invoke APDU in an ALERTING, CONNECT or FACILITY message while in state CFO-Divert, the Originating PTNX shall take account of the information therein, shall remain in the same state if received in an ALERTING or FACILITY message, and shall enter state CFO-Idle if received in a CONNECT message. The diverted-to number (as received in element nominatedNr of the last received diversionLegInformation1 invoke APDU) shall be presented to the calling user, if the capability exists, only if all of the following conditions are true:

- all previously received divertingLegInformation1 invoke APDUs contained value notificationWithDivertedToNr in element subscriptionOption; and

- this and any previously received divertingLegInformation3 invoke APDUs contained value TRUE in element of type PresentationAllowedIndicator; and

- no previous notification of a diverted-to number has been given to the calling user unless, since then, a divertingLegInformation1 invoke APDU with value cfnr in element diversionReason has been received.

The diverted-to name (as received in element redirectionName of the divertingLegInformation3 invoke APDU) may be presented to the calling user, if the capability exists, only if all of the three conditions above for the presentation of the diverted-to number are true and if not marked, within the element redirectionName, as presentation restricted.

On receipt of a CONNECT message, the Originating PTNX shall enter state CFO-Idle.

NOTE 6

In case of where a call enters another network from the PTN and call diversion occurs in that other network, no divertingLegInformation1 or divertingLegInformation3 invoke APDUs will be received by the Originating PTNX. Instead, notification(s) of the diversion in accordance with 6.3.2.2 may be received from the Outgoing Gateway PTNX. Such notifications will be handled in accordance with 7.4.3.3 of ETS 300 239.

6.5.1.2   Exceptional procedures

On call clearing during state CFO-Divert, the Originating PTNX shall enter state CFO-Idle.

6.5.2   Actions at a Transit PTNX

There are no special actions required in support of SS-CF.

6.5.3 Actions at the Served User PTNX

In the context of invocation, when a Served User PTNX also provides Re-routing PTNX functionality, in support of call diversion by forward switching, the joint requirements of 6.5.3 (for a Served User PTNX) and 6.5.4 (for a Re-routing PTNX) shall apply, with the exception that any communication between the Served User PTNX functionality and the Re-routing PTNX functionality will be an intra-PTNX matter. The messages specified for sending from the Served User PTNX towards the Re-routing PTNX or vice versa will not appear on any inter-PTNX link.

NOTE 7

The Served User PTNX can act also as Re-routing PTNX e.g. in cases where call diversion by re-routing has been rejected or where forward switching is appropriate according to implementation-specific reasons (e.g. the diverted-to user is located in the Served User PTNX).

6.5.3.1 Normal procedure

6.5.3.1.1 Activation

On receipt of an activateDiversionQ invoke APDU using the call reference of a call independent signalling connection (as specified in 7.3 of ETS 300 239), the Served User PTNX shall check the received basic service (element basicService) for the served user (element servedUserNr) and verify that remote activation is supported and enabled. The address of the activating user (element activatingUserNr) may also be taken into account in determining whether activation is to be allowed to proceed.

The Served User PTNX may use the procedures specified in 6.5.3.1.4 and/or local techniques for verifying, as far as possible, that the diverted-to user's number is valid.

If the activation request is acceptable, the Served User PTNX shall activate diversion of the type indicated by the element procedure, answer the activateDiversionQ invoke APDU with a return result APDU, store the received diverted-to number and the subaddress, if provided, and optionally convey an appropriate notification to the served user.

6.5.3.1.2 Deactivation

On receipt of a deactivateDiversionQ invoke APDU using the call reference of a call independent signalling connection (as specified in 7.3 of ETS 300 239), the Served User PTNX shall check the consistency of the received basic service (element basicService) for the served user (element servedUserNr). The address of the deactivating user (element deactivatingUserNr) may also be taken into account in determining whether deactivation is to be allowed to proceed.

If the deactivation request is valid, the Served User PTNX shall deactivate diversion of the type indicated by the element procedure, answer the deactivateDiversion invoke APDU with a return result APDU and optionally convey an appropriate notification to the served user.

6.5.3.1.3 Interrogation

On receipt of an interrogateDiversionQ invoke APDU using the call reference of a call independent signalling connection (as specified in 7.3 of ETS 300 239), the Served User PTNX shall check the interrogation request and answer the interrogateDiversionQ invoke APDU with a return result APDU if the interrogation request is valid and Call Forwarding is activated. The address of the interrogating user (element interrogatingUserNr) may also be taken into account in determining whether interrogation is to be allowed to proceed.

6.5.3.1.4   Verification of the diverted-to user's number

The Served User PTNX may use the procedure below to check with the Diverted-to PTNX whether the diverted-to number exists and whether there are any restrictions which might prevent call diversion.

The Served User PTNX shall send a checkRestriction invoke APDU to the Diverted-to PTNX using the call reference of a call independent signalling connection. The call independent signalling connection shall be established (or used, if an appropriate connection is already available) in accordance with the procedures specified in 7.3 of ETS 300 239. The CFS-Act-Wait state shall be entered and timer T5 shall be started.

NOTE 8

The number to be used in the Called party number information element when establishing the call independent signalling connection is outside the scope of this ETS. It can, for example, be the diverted-to number.

On receipt of a return result APDU in reply to the checkRestriction invoke APDU, the Served User PTNX shall treat the diverted-to user's number as a valid number, enter CFS-Act-Idle state and stop timer T5.

The Served User PTNX is responsible for clearing the call independent signalling connection towards the Diverted-to PTNX. This may occur on receipt of a return result APDU. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.5.3.1.5   Invocation

The detection of a call diversion invoke request results from different local procedures in the Served User PTNX.

When SS-CF is invoked, a callRerouting invoke APDU shall be sent in a call related FACILITY message to the Re-routing PTNX and the CFS-Requested state shall be entered. Sending of the FACILITY message for SS-CFU and SS-CFB shall be applicable in the basic call protocol control states Incoming Call Proceeding and Overlap Receiving. Sending of the FACILITY message for SS-CFNR shall be applicable in the basic call protocol control state Call Received.

The timer T1 shall be started by the Served User PTNX on entering the CFS-Requested state. The timer shall be stopped on receipt of a return result APDU of the callRerouting operation.

The following data elements and information elements shall be included in the argument of the callRerouting invoke APDU:

-   element reroutingReason containing a value other than unknown (if multiple diversions have occurred, reroutingReason contains the value of the last diversion);

-   element calledAddress as stored in the Served User PTNX as diverted-to number and, possibly, subaddress;

-   element diversionCounter containing the number of diversions undergone by the call (value ONE if this is the first diversion);

-   element qSIGInfoElement containing an embedded Bearer capability information element, as received in the incoming SETUP message, and any of the following information elements which were received in the incoming SETUP message: High layer compatibility, Low layer compatibility, Progress indicator and Party category;

-   element lastReroutingNr containing the number of the last diverting user;

- element subscriptionOption containing the served user's requirements for notifying the calling user;

- element callingPartySubaddress if a Calling party subaddress information element was received in the incoming SETUP message;

- element callingNumber as received in the incoming SETUP message in the Calling party number information element;

- element callingName if a callingName invoke APDU was received in the incoming SETUP message as defined in ETS 300 238 and recognised by the Served User PTNX;

- element originalCalledNr, only in case of multiple call forwarding, containing the number of the original called user;

- optionally element redirectingName, if available and if presentation is not restricted and if the PTNX has chosen to release this information;

- optionally element originalCalledName, only in case of multiple call forwarding, if available and if presentation is not restricted and if the PTNX has chosen to release this information;

On receipt of the return result APDU of the callRerouting operation, the Served User PTNX shall enter CFS-Inv-Idle state and may send an appropriate notification to the served user.

NOTE 9

The call between Re-routing PTNX and Served User PTNX is released by the Re-routing PTNX according to ETS 300 172.

6.5.3.2 Exceptional procedures

6.5.3.2.1 Activation

If the diverted-to user's number is detected as an invalid number or if the activation request cannot be accepted for other reasons, the Served User PTNX shall send back a return error APDU with an appropriate error value.

6.5.3.2.2 Deactivation

If the deactivation request is not valid, the Served User PTNX shall answer the deactivateDiversion invoke APDU with a return error APDU containing an appropriate error value.

6.5.3.2.3 Interrogation

If the interrogation request is not valid or if the particular type of Call Forwarding is not activated, the Served User PTNX shall answer the interrogateDiversionQ invoke APDU with a return error APDU containing an appropriate error value.

6.5.3.2.4 Verification of the diverted-to user's number

On receipt of a return error APDU in reply to the checkRestriction invoke APDU, the Served User PTNX shall treat the diverted-to user's number as an invalid number, enter the CFS-Act-Idle state and stop timer T5.

If timer T5 expires (i.e. the checkRestriction invoke APDU is not answered by the Diverted-to PTNX), if the call independent signalling connection cannot be established, or on receipt of a reject APDU (e.g. the checkRestriction operation is not supported by the Diverted-to PTNX), the Served User PTNX may treat the diverted-to number either

as valid or invalid depending on the particular cause of the failure. The Served User PTNX shall enter the CFS-Act-Idle state. Timer T5 shall be stopped on receipt of a reject APDU.

The Served User PTNX is responsible for clearing the call independent signalling connection towards the Diverted-to PTNX. This may occur on receipt of a return error or reject APDU or expiry of timer T5. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.5.3.2.5 Invocation

When SS-CF is invoked, but the callRerouting invoke APDU cannot be sent to the Re-routing PTNX (e.g. if the number of diversions has exceeded the maximum value), then the Served User PTNX shall maintain the incoming call for SS-CFNR and perform an implementation-specific procedure for SS-CFU and SS-CFB (e.g. release the call according to ETS 300 172 or override call diversion).

On receipt of the return error or reject APDU of the callRerouting operation or on expiry of timer T1, the Served User PTNX shall enter CFS-Inv-Idle state and shall perform an implementation-specific procedure (e.g. maintain the incoming call for SS-CFNR, release the call according to ETS 300 172 or try again using forward switching). Timer T1 shall be stopped on receipt of a return error or reject APDU of the callRerouting operation.

If a specific incoming call is received (e.g. from the diverted-to user to the served user), the Served User PTNX may not invoke SS-CF, but instead offer the call to the served user.

Subsequent to receipt of a callRerouting return result APDU, on receipt of a cfnrDivertedLegFailed invoke APDU (which indicates that SS-CFNR has been abandoned), the Served User PTNX shall remain in state CFS-Inv-Idle and may notify the served user.

On call clearing during CFS-Requested state, the Served User PTNX shall enter CFS-Inv-Idle state.

6.5.4 Actions at the Re-routing PTNX

6.5.4.1 Normal procedure

On receipt of a callRerouting invoke APDU in a FACILITY message during basic call protocol control states Overlap Sending or Outgoing Call Proceeding for SS-CFU/SS-CFB and Call Delivered for SS-CFNR, the Re-routing PTNX shall check if the diversion request is valid. If the diversion request can be performed, the Re-routing PTNX shall answer the callRerouting invoke APDU with a return result APDU in a FACILITY message, shall initiate a new call establishment to the new destination (diverted-to user) and in the case of SS-CFU or SS-CFB shall release the leg towards the Served User PTNX by sending a DISCONNECT message. In the case of SS-CFU or SS-CFB the return result APDU may instead by conveyed in the DISCONNECT message.

The SETUP message for the new call establishment shall include a divertingLegInformation2 invoke APDU. A callingName invoke APDU (see ETS 300 238) may be included in the SETUP message, if the element callingName was received in the callRerouting invoke APDU and if the Re-routing PTNX conforms to ETS 300 238.

The following specific basic call information elements shall be included:

- the information received in the element calledAddress of the callRerouting invoke APDU shall be included into the Called party numbers information element and, if subaddress information is present, into the Called party subaddress information element;

- the information received in the element callingNumber of the callRerouting invoke APDU shall be included into the Calling party number information element and, if subaddress information is present, into the Calling party subaddress information element;

- the Bearer capability information element as received in embedded form within the callRerouting invoke APDU, and any of the following information elements which were also received in embedded form in this APDU: High layer compatibility, Low layer compatibility, Progress indicator and Party category information elements.

If the Transit counter information element is used in the new SETUP message, it shall contain the value zero.

The following data elements shall be included in the argument of the divertingLegInformation2 invoke APDU:

- element diversionCounter as received in the callRerouting invoke APDU;

- element diversionReason as received in the element reroutingReason of the callRerouting invoke APDU;

- element divertingNr as received in the element lastReroutingNr of the callRerouting invoke APDU;

- optionally element originalCalledNr if received in the callRerouting invoke APDU;

- optionally element redirectingName if received in the callRerouting invoke APDU;

- optionally element originalCalledName if received in the callRerouting invoke APDU.

NOTE 10

As an implementation option, the Re-routing PTNX may have stored some of the information from the original SETUP message for inclusion in the new SETUP message to the diverted-to user.

The parameter reroutingReason received in the callRerouting invoke APDU shall indicate to the Re-routing PTNX whether the SS-CFU/SS-CFB or the SS-CFNR procedure is to be performed.

After the new SETUP message has been sent, the procedures of the Re-routing PTNX are split into two cases, SS-CFU/SS-CFB and SS-CFNR:

- For SS-CFU/SS-CFB, the Re-routing PTNX shall send a call related FACILITY message with a divertingLegInformation1 invoke APDU to the Originating PTNX. The two remaining legs of the call shall be joined together (Originating PTNX - Diverted-to PTNX);

- For SS-CFNR, the Re-routing PTNX shall move from the CFR-Idle state into the CFR-Invoked state and wait for further events as follows:

  * On receipt of an ALERTING message from the Diverted-to PTNX, the Re-routing PTNX shall initiate call clearing towards the Served-User PTNX according to ETS 300 172, send a divertingLegInformation1 invoke APDU in the FACILITY message to the Originating PTNX and enter the CFR-Idle state. The two remaining legs of the call shall be joined together (Originating PTNX - Diverted-to PTNX);

  * On receipt of a CONNECT message (if previously no ALERTING has been received) from the Diverted-to PTNX, the Re-routing PTNX shall initiate call clearing towards the Served User PTNX according to ETS 300 172, send a divertingLegInformation1 invoke APDU in the CONNECT message to the Originating PTNX and enter the CFR-Idle state. The two remaining legs of the call shall be joined together (Originating PTNX - Diverted-to PTNX);

  * On receipt of a CONNECT message from the Served User PTNX, the Re-routing PTNX shall initiate call clearing towards the Diverted-to PTNX according to ETS 300 172 and enter the CFR-Idle state. The CONNECT message shall be relayed to the Originating PTNX according to ETS 300 172. The original call shall remain (Originating PTNX - Served User PTNX).

The argument of the divertingLegInformation1 invoke APDU shall include elements diversionReason, subscriptionOption and nominatedNr as received in the argument of the callRerouting invoke APDU in the elements reroutingReason, subscriptionOption and calledAddress respectively.

NOTE 11

The Re-routing PTNX will pass on transparently a divertingLegInformation3 invoke APDU to the Originating PTNX as received by the Diverted-to PTNX. Where a divertingLegInformation1 invoke APDU is included in the CONNECT message, this will be in addition to the divertingLegInformation3 invoke APDU.

6.5.4.2   Exceptional procedures

If the diversion request cannot be performed on receipt of a callRerouting invoke APDU, a return error APDU including the appropriate error value shall be sent back in a FACILITY message.

For SS-CFNR, the Re-routing PTNX shall perform the following actions for events received in CFR-Invoked state:

- On receipt of a DISCONNECT, RELEASE or RELEASE COMPLETE message from the Diverted-to PTNX, the Re-routing PTNX shall complete call clearing towards the Diverted-to PTNX, send a cfnrDivertedLegFailed invoke APDU in a FACILITY message to the Served User PTNX and enter the CFR-Idle state. The original call shall remain (Originating PTNX - Served User PTNX);

- On receipt of a call clearing message from the Originating PTNX or Served User PTNX, the Re-routing PTNX shall continue call clearing according to ETS 300 172, stimulate release of the remaining two legs of the call and enter the CFR-Idle state.

6.5.5   **Actions at the Diverted-to PTNX**

6.5.5.1   **Normal procedure**

6.5.5.1.1   **Invocation**

On receipt of a SETUP message with a divertingLegInformation2 invoke APDU, the Diverted-to PTNX shall enter CFF-Inv-Wait state. A diversion notification, the redirecting number (and the original called number in case of multiple diversion) as received, and optionally the redirecting name (and the original called name in case of multiple diversion) shall be conveyed together with the basic call establishment information to the called user if able and authorised to receive the notification.

When it is known whether presentation restriction applies to the diverted-to number, the Diverted-to PTNX shall enter CFF-Inv-Idle state and send a divertingLegInformation3 invoke APDU in a FACILITY, ALERTING or CONNECT message to the Originating PTNX. This information shall indicate whether the presentation of the diverted-to number is restricted and may also indicate the name of the diverted-to user in element redirectionName and whether its presentation is restricted.

6.5.5.1.2   **Verification of the diverted-to user's number**

On receipt of a checkRestriction invoke APDU using the call reference of a call independent signalling connection (as specified in 7.3 of ETS 300 239), the Diverted-to PTNX shall check if the address of the intended diverted-to user (element divertedToNr in the argument) exists and if there are any restrictions (e.g. basic service) which could prevent call diversion from the served user (element servedUserNr in the argument) to that user. A return result APDU shall be sent back to the Served User PTNX if there are no restrictions.

6.5.5.2   **Exceptional procedures**

6.5.5.2.1   **Invocation**

On call clearing during CFF-Inv-Wait state, the Diverted-to PTNX shall enter CFF-Inv-Idle state.

6.5.5.2.2   **Verification of the diverted-to user's number**

A return error APDU shall be sent back to the Served User PTNX if there are any restrictions detected by the Diverted-to PTNX.

6.5.6   **Actions at the Activating PTNX**

6.5.6.1   **Normal procedure**

On receipt of a remote activation request from the user, the Activating PTNX shall send an activateDiversionQ invoke APDU to the Served User PTNX using the call reference of a call independent signalling connection. The call independent signalling connection shall be established (or used, if an appropriate connection is already available) in accordance with the procedures specified in 7.3 of ETS 300 239. The Activating PTNX shall enter the CFA-Wait state and start timer T2. On receipt of the activateDiversionQ return result APDU, the Activating PTNX shall stop timer T2, revert to the CFA-Idle state and convey the return result back to the activating user.

NOTE 12

The number to be used in the Called party number information element when establishing the call independent signalling connection is outside the scope of this ETS. It can, for example, be the diverting number.

The Activating PTNX is responsible for clearing the call independent signalling connection towards the Served User PTNX. This may occur on receipt of a return result APDU. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.5.6.2 Exceptional procedures

On receipt of the activateDiversionQ return error or reject APDU from the Served User PTNX, the Activating PTNX shall stop timer T2, revert to the CFA-Idle state and indicate rejection to the activating user.

If timer T2 expires (i.e. the activateDiversionQ invoke APDU is not answered by the Served User PTNX), the Activating PTNX shall indicate rejection to the user and enter CFA-Idle state.

The Activating PTNX is responsible for clearing the call independent signalling connection towards the Served User PTNX. This may occur on receipt of a return error or reject APDU or expiry of timer T2. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.5.7 Actions at the Deactivating PTNX

6.5.7.1 Normal procedure

On receipt of a remote deactivation request from the user, the Deactivating PTNX shall send a deactivateDiversionQ invoke APDU to the Served User PTNX using the call reference of a call independent signalling connection. The call independent signalling connection shall be established (or used, if an appropriate connection is already available) in accordance with the procedures specified in 7.3 of ETS 300 239. The Deactivating PTNX shall enter the CFD-Wait state and start timer T3. On receipt of the deactivateDiversionQ return result APDU, the Deactivating PTNX shall stop timer T3, revert to the CFD-Idle state and convey the return result back to the deactivating user.

NOTE 13

The number to be used in the Called party number information element when establishing the call independent signalling connection is outside the scope of this ETS. It can, for example, be the diverting number.

The Deactivating PTNX is responsible for clearing the call independent signalling connection towards the Served User PTNX. This may occur on receipt of a return result APDU. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.5.7.2 Exceptional procedures

On receipt of the deactivateDiversionQ return error or reject APDU from the Served User PTNX, the Deactivating PTNX shall stop timer T3, revert to the CFD-Idle state and indicate rejection to the deactivating user.

If timer T3 expires (i.e. the deactivateDiversionQ invoke APDU is not answered by the Served User PTNX), the Deactivating PTNX shall indicate rejection to the user and enter CFD-Idle state.

The Deactivating PTNX is responsible for clearing the call independent signalling connection towards the Served User PTNX. This may occur on receipt of a return error or reject APDU or expiry of timer T3. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.5.8 Actions at the Interrogating PTNX

6.5.8.1 Normal procedure

On receipt of a remote interrogate request from the user, the Interrogating PTNX shall send a interrogateDiversionQ invoke APDU to the Served User PTNX using the call reference of a call independent signalling connection. The call independent signalling connection shall be established (or used, if an appropriate connection is already available) in accordance with the procedures specified in 7.3 of ETS 300 239. The Interrogating PTNX shall enter the CFI-Wait state and start timer T4. On receipt of the interrogateDiversionQ return result or return error APDU, the Interrogating PTNX shall stop timer T4, revert to the CFI-Idle state and convey the return result or return error back to the interrogating user.

NOTE 14

The number to be used in the Called party number information element when establishing the call independent signalling connection is outside the scope of this ETS. It can, for example, be the diverting number.

The Interrogating PTNX is responsible for clearing the call independent signalling connection towards the Served User PTNX. This may occur on receipt of a return result APDU. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.5.8.2 Exceptional procedures

On receipt of the interrogateDiversionQ return error or reject APDU from the Served User PTNX, the Interrogating PTNX shall stop timer T4, revert to the CFI-Idle state and indicate rejection to the interrogating user.

If timer T4 expires (i.e. the interrogateDiversionQ invoke APDU is not answered by the Served User PTNX), the Interrogating PTNX shall indicate rejection to the user and enter CFI-Idle state.

The Interrogating PTNX is responsible for clearing the call independent signalling connection towards the Served User PTNX. This may occur on receipt of a return error or reject APDU or expiry of timer T4. Alternatively, the signalling connection may be retained for other applications, if appropriate.

6.6 SS-CF impact of interworking with public ISDNs

When an Incoming Gateway PTNX also provides Re-routing PTNX functionality, in support of call diversion by re-routing, the joint requirements of 6.6.1 (for an Incoming Gateway PTNX) and 6.5.4 (for a Re-routing PTNX) shall apply.

NOTE 15

Procedures across the interface at the Q reference point for activation, deactivation and interrogation of Diversion provided by the public ISDN (including served user notifications) are outside the scope of this ETS.

6.6.1 Impact of interworking on incoming calls

6.6.1.1 Diversion within the PTN

The Incoming Gateway PTNX shall send appropriate notifications to the calling user in the public ISDN according to the information presentation rules specified for the Originating PTNX based on information from the divertingLegInformation1 invoke APDU received from the Re-routing PTNX and the divertingLegInformation3 invoke APDU received from the Diverted-to PTNX.

If the divertingLegInformation3 invoke APDU is not received prior to or in the CONNECT message from the Diverted-to PTNX, the Incoming Gateway PTNX shall indicate to the public ISDN that presentation is restricted.

6.6.1.2 Diversion within the public ISDN

If the Incoming Gateway PTNX is informed that an incoming call from the public ISDN has already been diverted, it shall send a divertingLegInformation2 invoke APDU in the SETUP message towards the Diverted-to PTNX.

The incoming Gateway PTNX shall indicate to the public ISDN whether presentation of the diverted-to number is allowed based on information received from the Diverted-to PTNX in the divertingLegInformation3 invoke APDU.

If the divertingLegInformation3 invoke APDU is not received prior to or in the CONNECT message from the Diverted-to PTNX, the Incoming Gateway PTNX shall indicate to the public ISDN that presentation is restricted.

6.6.1.3 Partial re-routing

On receipt of a callRerouting invoke APDU in a FACILITY message from the Served User PTNX, the Incoming Gateway PTNX may request the public ISDN to perform partial re-routing, instead of itself providing Re-routing PTNX functionality.

On receipt of acceptance from the public ISDN, the Incoming Gateway PTNX shall send a callRerouting return result APDU in a DISCONNECT or FACILITY message to the Served User PTNX. If sent in a FACILITY message, the Incoming Gateway PTNX shall then sent a DISCONNECT message to the Served User PTNX.

On receipt of rejection from the public ISDN, the Incoming Gateway PTNX may provide Re-routing PTNX functionality or send a return error APDU in a FACILITY message to the Served User PTNX.

6.6.2 Impact of interworking on outgoing calls

6.6.2.1 Diversion within the PTN

The Outgoing Gateway PTNX shall convert a received divertingLegInformation2 invoke APDU from the Re-routing PTNX to an appropriate indication to the public ISDN (diverted-to user); a divertingLegInformation3 invoke APDU shall be sent to the Originating PTNX on receipt of number restriction information from the public ISDN.

If no information is received from the public ISDN which can be used to generate the divertingLegInformation3 invoke APDU, the Outgoing Gateway PTNX shall take no specific action, i.e. the normal basic call handling procedure applies.

NOTE 16

In the case that no such information is received, the presentation of the redirection number at the calling PTN user is not allowed.

6.6.2.2 Diversion within the public ISDN

The Outgoing Gateway PTNX shall pass the notifications received from the public ISDN (Redirection number and Notification indicator information elements) to the Originating PTNX within Notification indicator information elements. The received Redirection number shall be enveloped into a Notification indicator element according to 6.3.2.2.

6.7 SS-CF impact of interworking with non-ISDNs

When an Incoming Gateway PTNX also provides Re-routing PTNX functionality, in support of call diversion by re-routing, the joint requirements of 6.7.1 (for an Incoming Gateway PTNX) and 6.5.4 (for a Re-routing PTNX) shall apply.

6.7.1 Impact of interworking on incoming calls

When interworking with another network which supports equivalent supplementary services, the Incoming Gateway PTNX may provide conversion between the signalling specified in this ETS and the signalling protocol of the other network.

6.7.2 Impact of interworking on outgoing calls

When interworking with another network which supports equivalent supplementary services, the Outgoing Gateway PTNX may provide conversion between the signalling specified in this ETS and the signalling protocol of the other network.

6.8 SS-CF parameter values (Timers)

6.8.1 Timer T1

This timer shall be started by the Served User PTNX when a callRerouting invoke APDU is sent to the Re-routing PTNX. The timer shall be stopped on receipt of a return result, return error or reject APDU of the callRerouting operation. The expiry of this timer shall be equivalent to the receipt of a reject APDU.

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

6.8.2 Timer T2

This timer shall be started by the Activating PTNX when an activateDiversionQ invoke APDU is sent to the Served User PTNX. The timer shall be stopped on receipt of a return result, return error or reject APDU of the activateDiversionQ operation. The expiry of this timer shall be equivalent to the receipt of a reject APDU.

Timer T2 shall have a value of not less than 30 seconds.

6.8.3 Timer T3

This timer shall be started by the Deactivating PTNX when a deactivateDiversionQ invoke APDU is sent to the Served User PTNX. The timer shall be stopped on receipt of a return result, return error or reject APDU of the deactivateDiversionQ operation. The expiry of this timer shall be equivalent to the receipt of a reject APDU.

Timer T3 shall have a value of not less than 15 seconds.

6.8.4   Timer T4

This timer shall be started by the Interrogating PTNX when an interrogateDiversionQ invoke APDU is sent to the Served User PTNX. The timer shall be stopped on receipt of a return result, return error or reject APDU of the interrogateDiversionQ operation. The expiry of this timer shall be equivalent to the receipt of a reject APDU.

Timer T4 shall have a value of not less than 15 seconds.

6.8.5   Timer T5

This timer shall be started by the Served User PTNX when a checkRestriction invoke APDU is sent to the Diverted-to PTNX. The timer shall be stopped on receipt of a return result, return error or reject APDU of the checkRestriction operation. The expiry of this timer shall be equivalent to the receipt of a reject APDU.

Timer T5 shall have a value of not less than 15 seconds.

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

A.1 Introduction

The supplier of a protocol implementation which is claimed to conform to this ETS shall complete the Protocol Implementation Conformance Statement (PICS) proforma in clause A.3.

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 a protocol implementor, as a check list to reduce the risk of failure to conform to the ETS through oversight;

- by the supplier and acquirer (or potential acquirer) of the implementation, as a detailed indication of the capabilities of the implementation, stated relative to the common basis for understanding provided by the standard PICS proforma;

- by the user (or potential user) of the implementation, as a basis for initially checking the possibility of interworking with another implementation (note that, while interworking can not be guaranteed, failure to interwork can often be predicted from incompatible PICS);

- by a protocol tester, as the basis for selecting appropriate tests against which to asses the claim for conformance of the implementation.

A.2 Instructions for completing the PICS proforma

A.2.1 General structure of the PICS proforma

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

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

m   mandatory (the capability is required for conformance to the protocol);

o   optional (the capability is not required for conformance to the protocol, but if the capability is implemented, it is required 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).

A.2.2 Additional information

Items of Additional Information allow a supplier to provide further information intended to assist the interpretation of the PICS. It is not intended 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.

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

A.3   PICS proforma for ETS 300 257

A.3.1   Implementation identification

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

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

A.3.2 Protocol summary

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

Date of Statement	

A.3.3 General

Item	Name of Item	Reference	Status	N/A	Support
A1	Support of SS-CFU		o.1		Yes [ ] No [ ]
A2	Support of SS-CFB		o.1		Yes [ ] No [ ]
A3	Support of SS-CFNR		o.1		Yes [ ] No [ ]
A4	Behaviour as Originating PTNX		o.2		Yes [ ] No [ ]
A5	Behaviour as Terminating PTNX		o.2		Yes [ ] No [ ]
A6	Behaviour as Transit PTNX		o.2		Yes [ ] No [ ]
A7	Behaviour as Incoming Gateway PTNX		o.2		Yes [ ] No [ ]
A8	Behaviour as Outgoing Gateway PTNX		o.2		Yes [ ] No [ ]

A.3.4 Procedures

Item	Name of Item	Reference	Status	N/A	Support
B1	Procedures at the Originating PTNX	6.5.1	A4:m	[ ]	m: Yes [ ]
B2	Procedures at the Transit PTNX	6.5.2	A6:m	[ ]	m: Yes [ ]
B3	Procedures at the Re-routing PTNX	6.5.4	c.1	[ ]	o: Yes [ ] No [ ]
B4	Procedures at the Served User PTNX, activation	6.5.3.1.1, 6.5.3.2.1	A5:o	[ ]	o: Yes [ ] No [ ]
B5	Procedures at the Served User PTNX, deactivation	6.5.3.1.2, 6.5.3.2.2	A5:o	[ ]	o: Yes [ ] No [ ]
B6	Procedures at the Served User PTNX, interrogation	6.5.3.1.3 6.5.3.2.3	A5:o	[ ]	o: Yes [ ] No [ ]
B7	Procedures at the Served User PTNX, verification of diverted-to number	6.5.3.1.4, 6.5.3.2.4	A5:o	[ ]	o: Yes [ ] No [ ]
B8	Procedures at the Served User PTNX, invocation	6.5.3.1.5, 6.5.3.2.5	A5:m	[ ]	m: Yes [ ]
B9	Procedures at the Diverted-to PTNX, invocation	6.5.5.1.1, 6.5.5.2.1	A5:m	[ ]	m: Yes [ ]
B10	Procedures at the Diverted-to PTNX, verification of diverted-to number	6.5.5.1.2, 6.5.5.2.2	A5:o	[ ]	o: Yes [ ] No [ ]
B11	Procedures at the Activating PTNX	6.5.6	o		Yes [ ] No [ ]
B12	Procedures at the Deactivating PTNX	6.5.7	o		Yes [ ] No [ ]
B13	Procedures at the Interrogation PTNX	6.5.8	o		Yes [ ] No [ ]
B14	Procedures at the Incoming Gateway PTNX to public ISDN, diverting within the PTN	6.6.1.1	A7:m	[ ]	m: Yes [ ]
B15	Procedures at the Incoming Gateway PTNX, diverting within the public ISDN	6.6.1.2	A7:m	[ ]	m: Yes [ ]
B16	Procedures at the Incoming Gateway PTNX to public ISDN, partial re-routing	6.6.1.3	A7:o	[ ]	o: Yes [ ] No [ ]
B17	Procedures at the Outgoing Gateway PTNX to public ISDN, diverting within the PTN	6.6.2.1	A8:m	[ ]	m: Yes [ ]
B18	Procedures at the Outgoing Gateway PTNX, diverting within the public ISDN	6.6.2.2	A8:m	[ ]	m: Yes [ ]
B19	Procedures at the Incoming Gateway PTNX to another network (Non-ISDN)	6.7.1	A7:o	[ ]	o: Yes [ ] No [ ]
B20	Procedures at the Outgoing Gateway PTNX to another network (Non-ISDN)	6.7.2	A8:o	[ ]	o: Yes [ ] No [ ]

c.1:   if A4 or A7 then mandatory

else if A5 then optional else N/A

A.3.5 Coding

Item	Name of Item	Reference	Status	N/A	Support
C1	Sending of redirectionName element in divertingLegInformation3 APDU	6.3.1	B9:o	[ ]	o: Yes [ ] No [ ]
C2	Receipt of redirectionName element in divertingLegInformation3 APDU	6.3.1	B1:o	[ ]	o: Yes [ ] No [ ]
C3	Sending of redirectingName element in callRerouting and divertingLegInformation2 APDUs	6.3.1	c.1	[ ]	o: Yes [ ] No [ ]
C4	Receipt of redirectingName element in callRerouting and divertingLegInformation2 APDUs	6.3.1	c.2	[ ]	o: Yes [ ] No [ ]
C5	Sending of originalCalledName element in callRerouting and divertingLegInformation2 APDUs	6.3.1	c.1	[ ]	o: Yes [ ] No [ ]
C6	Receipt of originalCalledName element in callRerouting and divertingLegInformation2 APDUs	6.3.1	c.2	[ ]	o: Yes [ ] No [ ]
C7	Sending of activateDiversionQ invoke APDU and receipt of return result and return error APDUs	6.3.1	B11:m	[ ]	m: Yes [ ]
C8	Receipt of activateDiversionQ invoke APDU and sending of return result and return error APDUs	6.3.1	B4:m	[ ]	m: Yes [ ]
C9	Sending of deactivateDiversionQ invoke APDU and receipt of return result and return error APDUs	6.3.1	B12:m	[ ]	m: Yes [ ]
C10	Receipt of deactivateDiversionQ invoke APDU and sending of return result and return error APDUs	6.3.1	B5:m	[ ]	m: Yes [ ]
C11	Sending of interrogateDiversionQ invoke APDU and receipt of return result and return error APDUs	6.3.1	B13:m	[ ]	m: Yes [ ]
C12	Receipt of interrogateDiversionQ invoke APDU and sending of return result and return error APDUs	6.3.1	B6:m	[ ]	m: Yes [ ]
C13	Sending of checkRestriction invoke APDU and receipt of return result and return error APDUs	6.3.1	B7:m	[ ]	m: Yes [ ]

Item	Name of Item	Reference	Status	N/A	Support
C14	Receipt of checkRestriction invoke APDU and sending of return result and return error APDU	6.3.1	B10:m	[ ]	m: Yes [ ]
C15	Sending of callRerouting invoke APDU and receipt of return result and return error APDUs	6.3.1	B8:m	[ ]	m: Yes [ ]
C16	Receipt of callRerouting invoke APDU and sending of return result and return error APDUs	6.3.1	B3:m	[ ]	m: Yes [ ]
C17	Sending of divertingLegInformation1 invoke APDU	6.3.1	B3:m	[ ]	m: Yes [ ]
C18	Receipt of divertingLegInformation1 invoke APDU	6.3.1	B1:m	[ ]	m: Yes [ ]
C19	Sending of divertingLegInformation2 invoke APDU	6.3.1	B3:m	[ ]	m: Yes [ ]
C20	Receipt of divertingLegInformation2 invoke APDU	6.3.1	B9:m	[ ]	m: Yes [ ]
C21	Sending of divertingLegInformation3 invoke APDU	6.3.1	B9:m	[ ]	m: Yes [ ]
C22	Receipt of divertingLegInformation3 invoke APDU	6.3.1	B1:m	[ ]	m: Yes [ ]
C23	Sending of cfnrDivertedLegFailed invoke APDU	6.3.1	c.3	[ ]	m: Yes [ ]
C24	Receipt of cfnrDivertedLegFailed invoke APDU	6.3.1	c.4	[ ]	m: Yes [ ]
C25	Sending of Notification indicator containing "call is diverted" or embedded Redirection number information element	6.3.2.2	c.5	[ ]	m: Yes [ ]
C26	Recognition of "call is diverted" notification and embedded Redirection number information element in received Notification indicator information element	6.3.2.2	c.6	[ ]	o: Yes [ ] No [ ]

c.1:   if B3 or B8 then optional, else N/A
c.2:   if B3 or B9 then optional, else N/A
c.3:   if B3 and A3 then mandatory, else N/A
c.4:   if B8 and A3 then mandatory, else N/A
c.5:   if B18 or B20 then mandatory, else N/A
c.6:   if B1 or B14 or B19 then optional, else N/A

A.3.6 Timers

Item	Name of Item	Reference	Status	N/A	Support
D1	Support of timer T1	6.8.1	B8:m	[ ]	m: Yes [ ]
D2	Support of timer T2	6.8.2	B11:m	[ ]	m: Yes [ ]
D3	Support of timer T3	6.8.3	B12:m	[ ]	m: Yes [ ]
D4	Support of timer T4	6.8.4	B13:m	[ ]	m: Yes [ ]
D5	Support of timer T5	6.8.5	B7:m	[ ]	m: Yes [ ]

Annex B (informative) :   Examples of message sequences

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

1   The following notation is used:

               Message containing SS-CF information;

               Basic call message without SS-CF information;

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

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

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

B.1   Message sequences for SS-CFU/SS-CFB invocation

Figure B.1 shows the successful invocation of SS-CFU/SS-CFB.
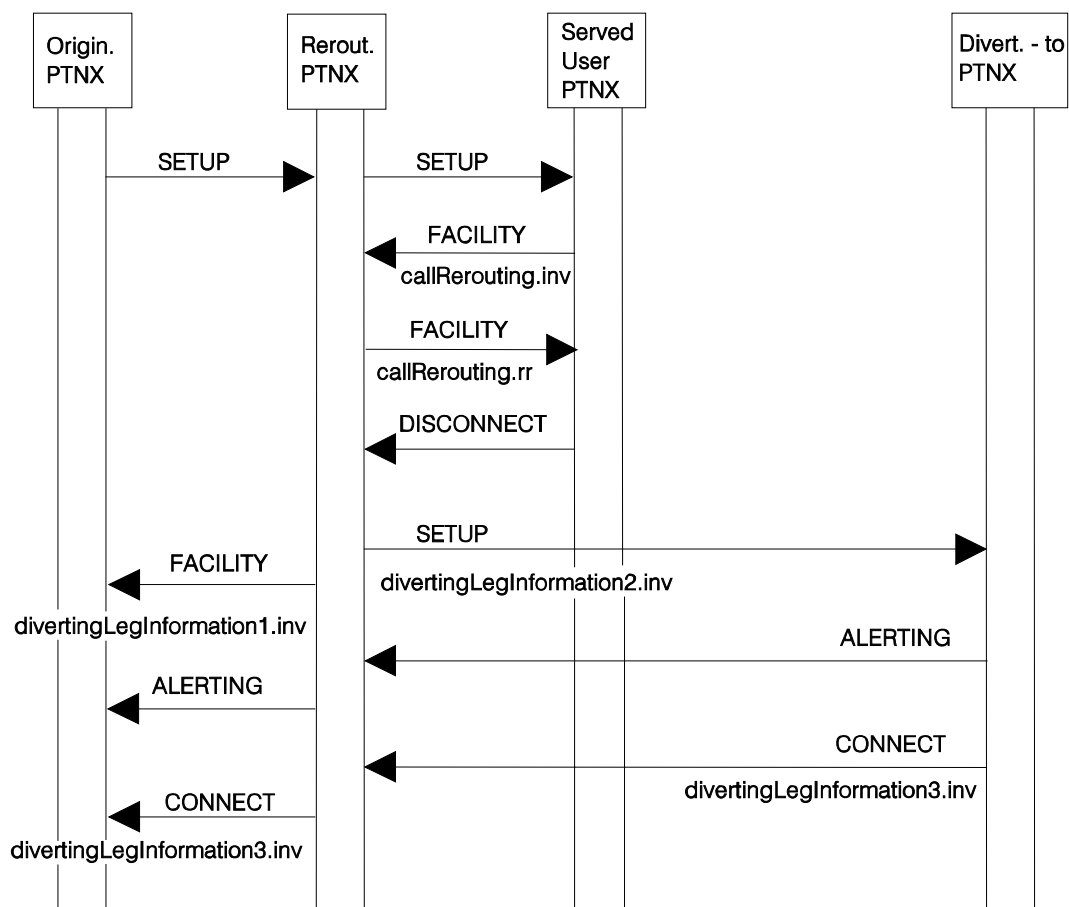
Figure B.1 - Message sequence for successful invocation of SS-CFU/SS-CFB

Figures B.2 and B.3 show unsuccessful invocations of SS-CFU/SS-CFB.
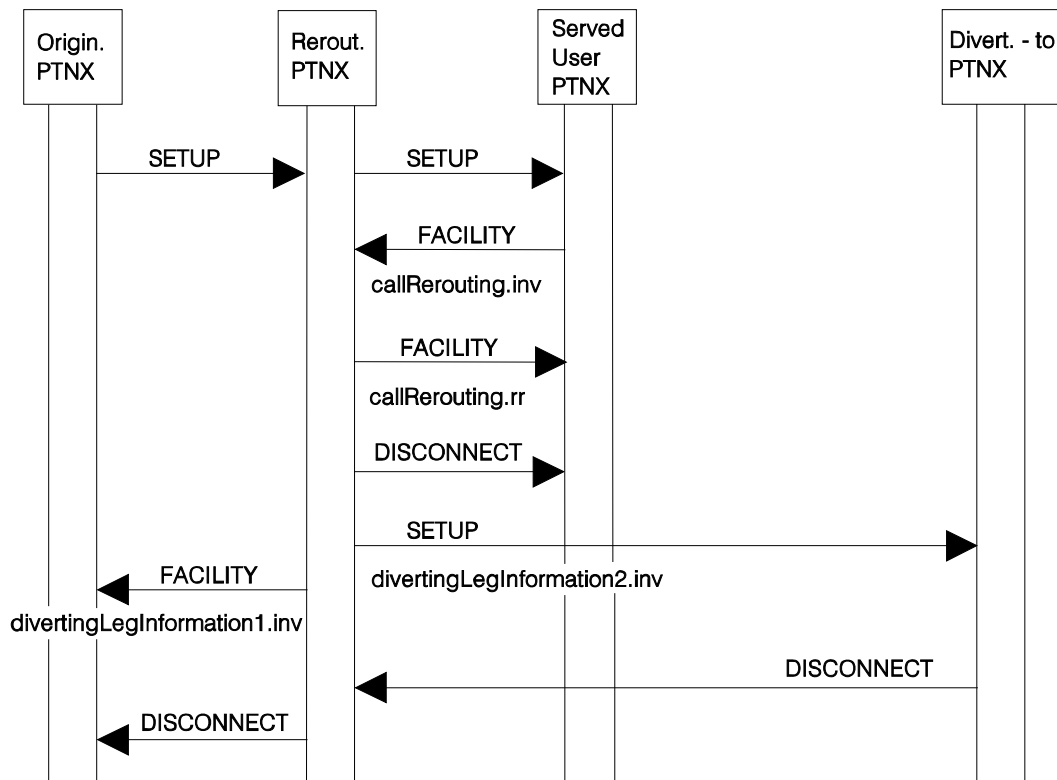
Figure B.2 - Message sequence for unsuccessful invocation of SS-CFU/SS-CFB: Failure of diverted call
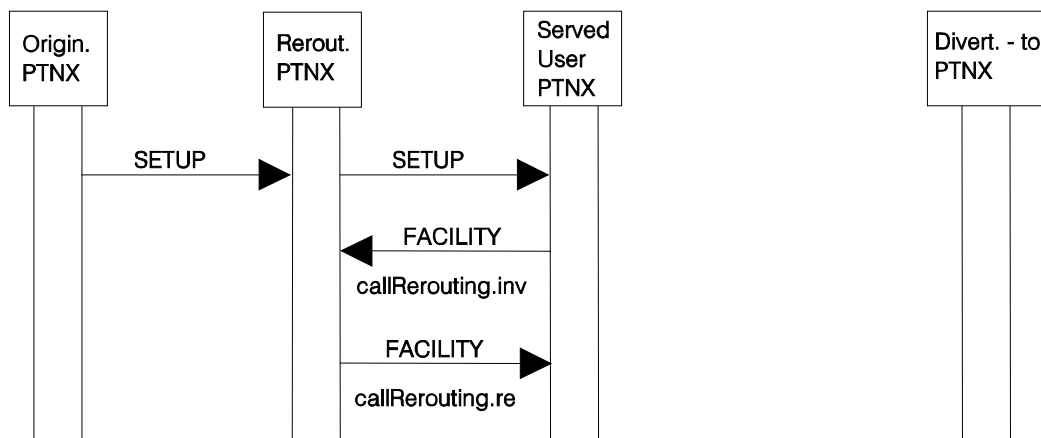
Figure B.3 - Message sequence for unsuccessful invocation of SS-CFU/SS-CFB: Rejection of re-routing request

B.2   Message sequences for SS-CFNR invocation

Figure B.4 shows the successful invocation of SS-CFNR.
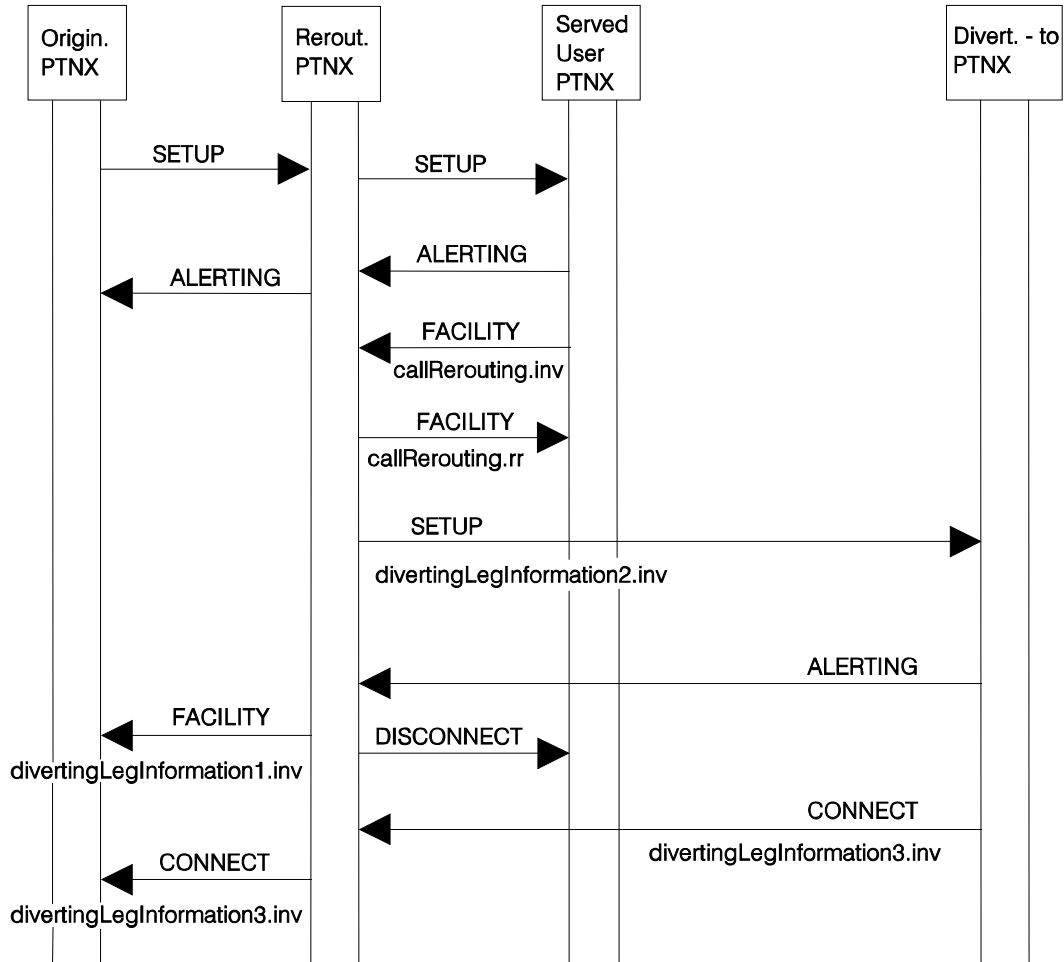
Figure B.4 - Message sequence for successful invocation of SS-CFNR

Figures B.5 and B.6 show unsuccessful invocations of SS-CFNR.
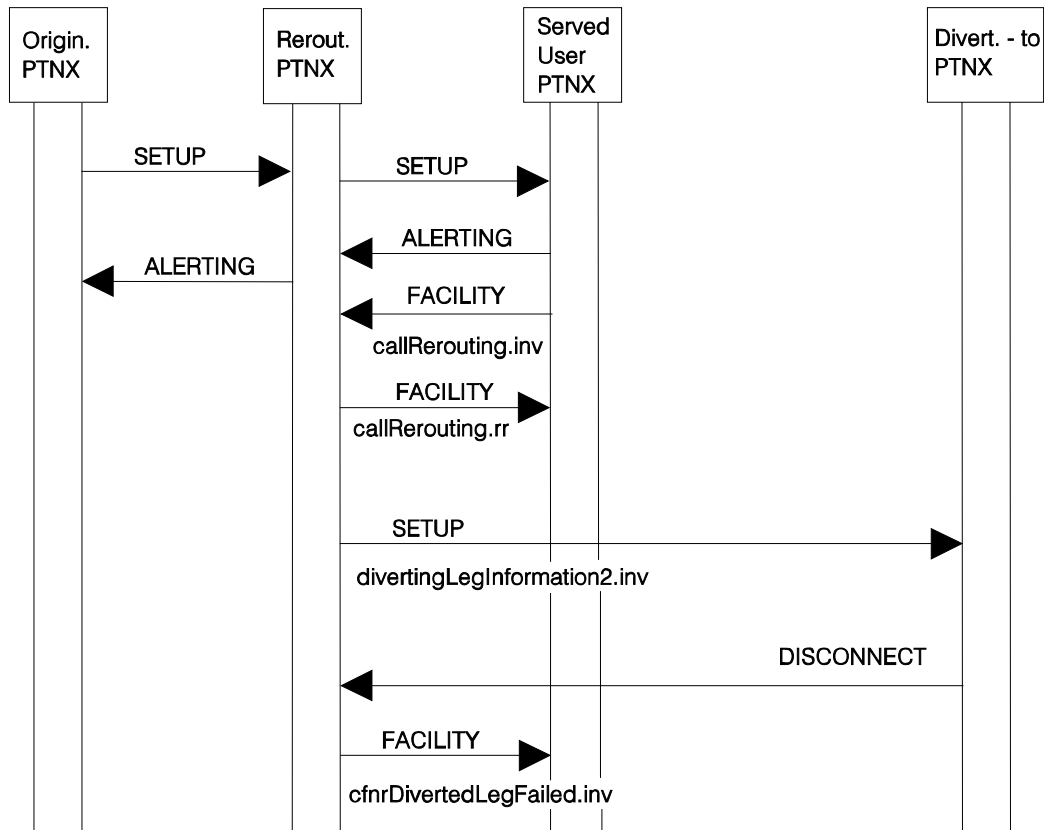
Figure B.5 - Message sequence for unsuccessful invocation of SS-CFNR: CFNR not completed
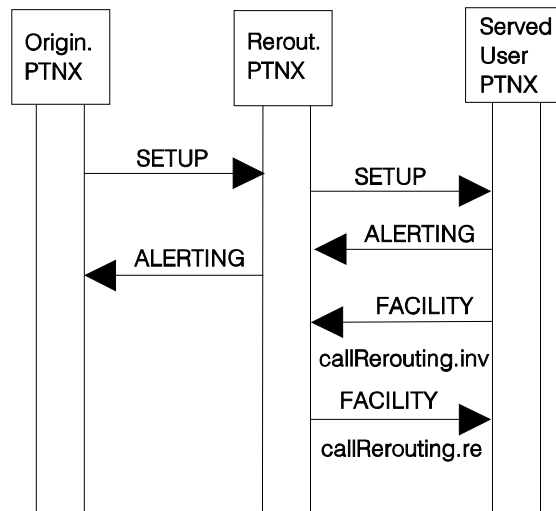
Figure B.6 - Message sequence for unsuccessful invocation of SS-CFNR: Re-routing rejected

Figure B.7 shows the case in SS-CFNR when user B answers before alerting of user C.
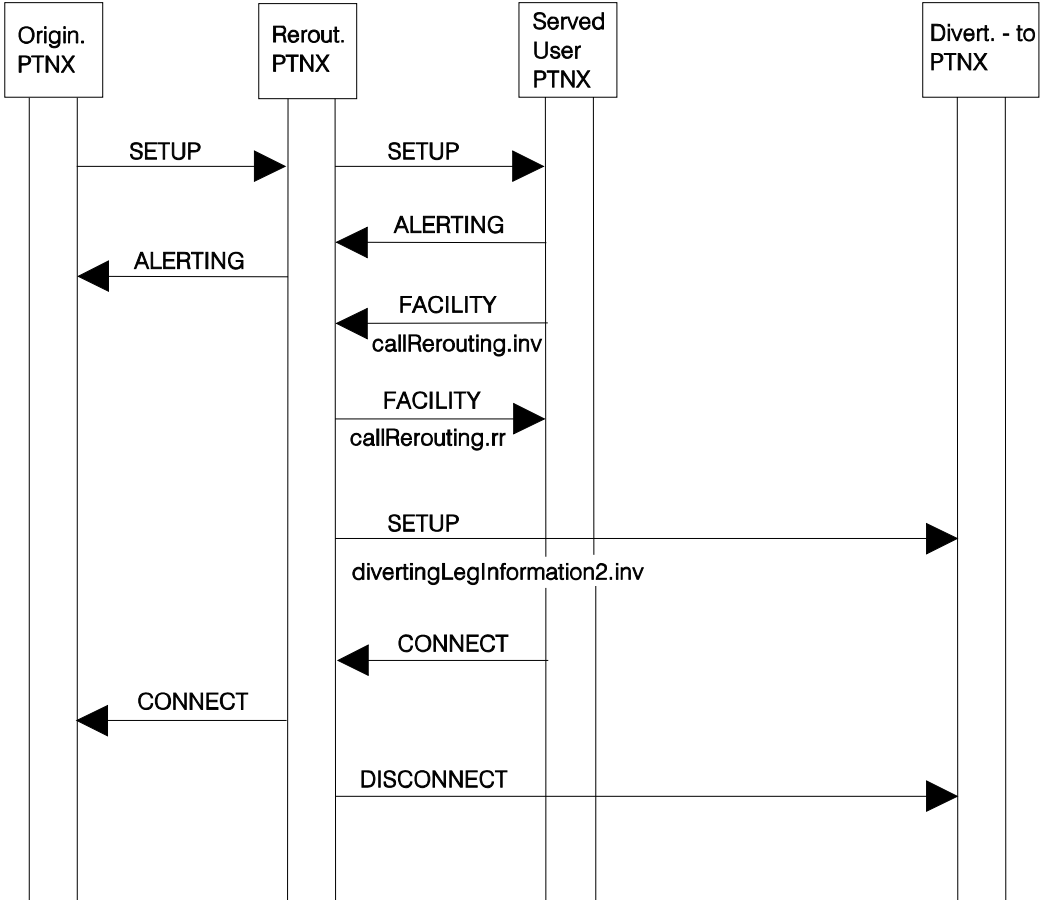
Figure B.7 - Message sequence for SS-CFNR when user B answers before alerting of user C

B.3   Message sequences for activation, deactivation and interrogation

Figure B.8 shows the successful activation of SS-CF including verification of the diverted-to number. This example shows the particular case of a Transit PTNX between the Served User PTNX and the Diverted-to PTNX.

In this example, the signalling connection for activation and the signalling connection for verification of the diverted-to number are each established for the purpose and released immediately afterwards.
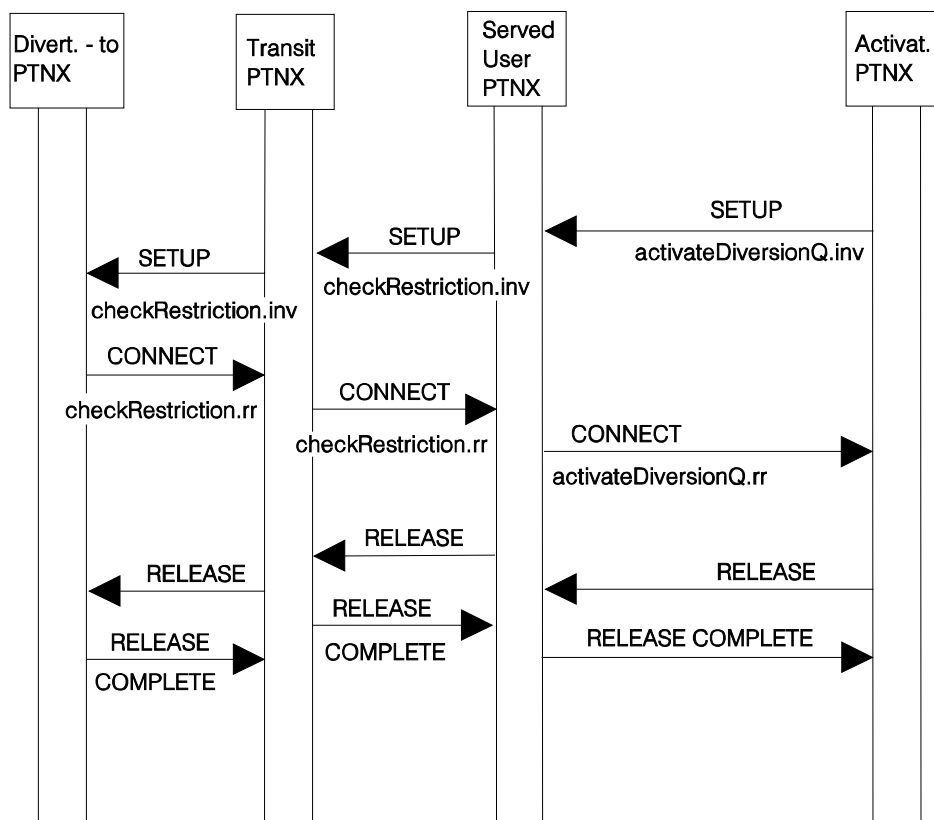
Figure B.8 - Message sequence for activation of SS-CF

Figure B.9 shows the successful deactivation of SS-CF. In this example, the signalling connection for deactivation is established for the purpose and released immediately afterwards.
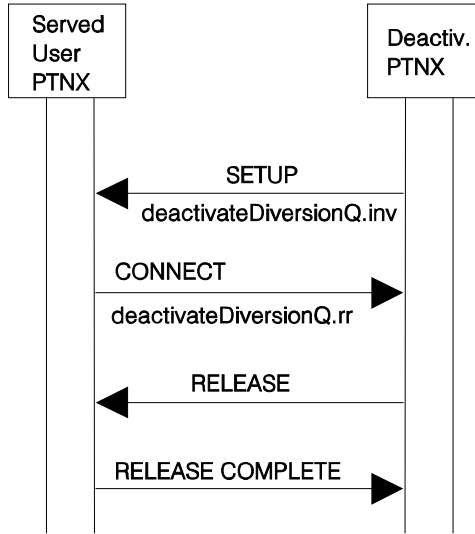
Figure B.9 - Message sequence for deactivation of SS-CF

Figure B.10 shows the successful interrogation of SS-CF. In this example, the signalling connection for interrogation is established for the purpose and released immediately afterwards.
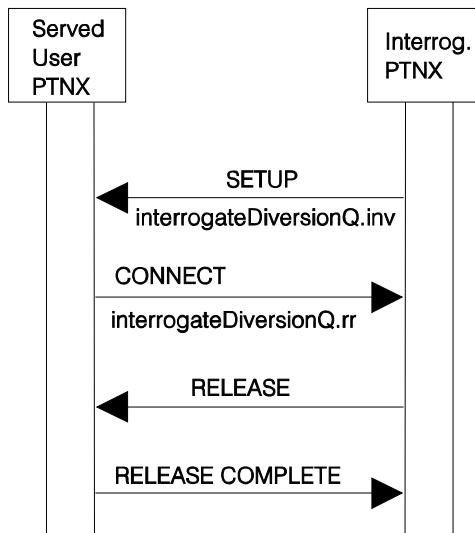
Figure B.10 - Message sequence for interrogation of SS-CF

Annex C (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-CF Supplementary Service Control entity at a particular type of PTNX. In accordance with the protocol model described in ETS 300 239, the Supplementary Service Control entity uses, via the Co-ordination Function, the services of Generic Functional Transport Control and Basic Call Control.

Where an output symbol represents a primitive to the Co-ordination Function, and that primitive results in a message being sent, the output bears the name of the message and any remote operations APDU(s) or notification(s) contained in that message. In case of a message specified in ETS 300 172, basic call actions associated with the sending of that message are deemed to occur.

Where an input symbol represents a primitive from the Co-ordination Functions and that primitive is the result of a message being received, the input signal bears the name of the message and any remote operation APDU(s) or notifications(s) 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 have occurred.

C.1   SDL representation of SS-CF at the Originating PTNX

Figure C.1 shows the behaviour of an SS-CF Supplementary Service Control entity within the Originating PTNX.

Input signals from the right represent messages received via Protocol Control or primitives from the Co-ordination Function. Outputs signals to the left represent primitives to the calling user.

Process ETS300257   Figure_C.1(8)
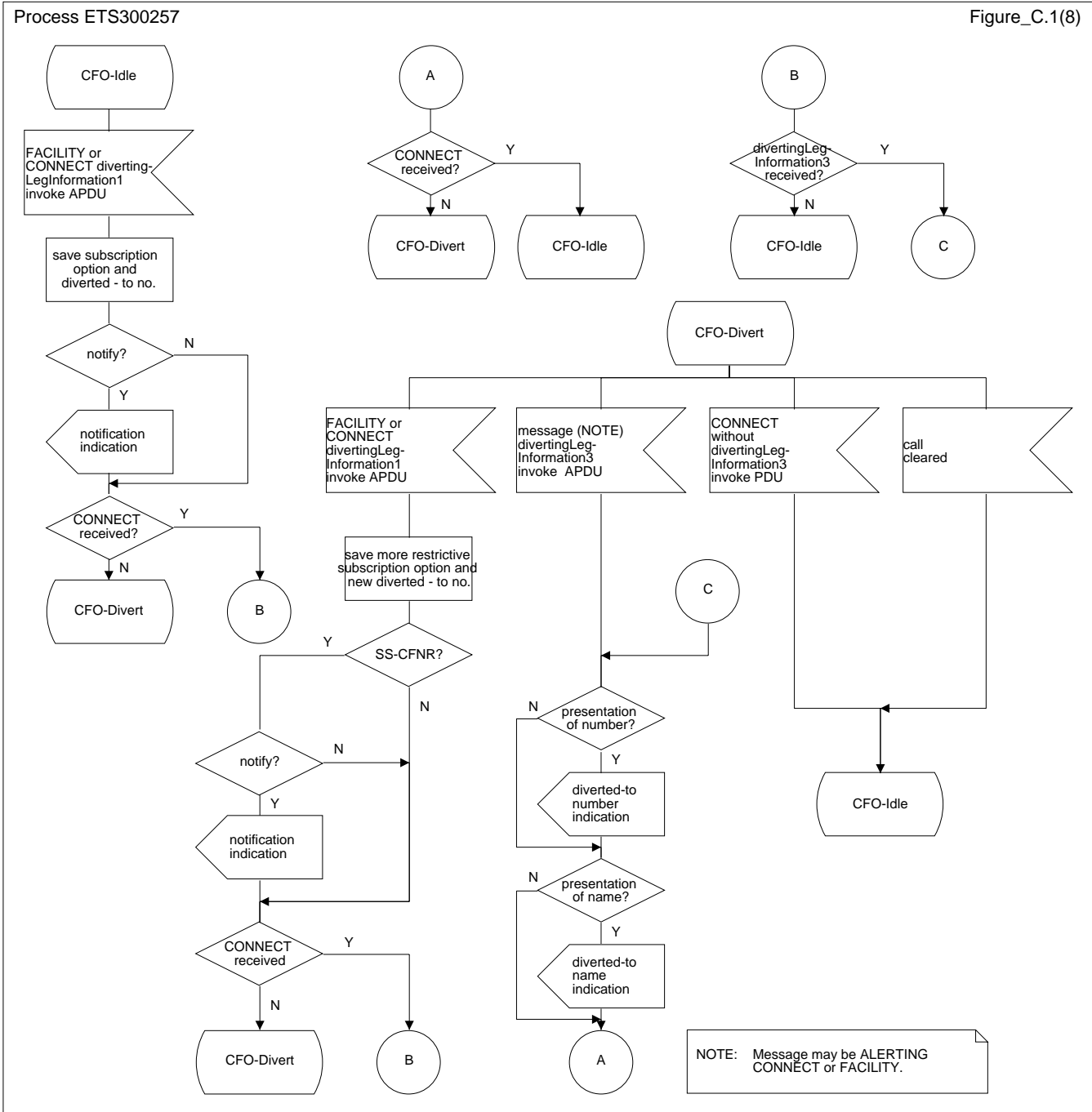
Figure C.1 - SDL for Originating PTNX

C.2   SDL representation of SS-CF at the Re-routing PTNX

Figure C.2 shows the behaviour of an SS-CF Supplementary Service Control entity within the Re-routing PTNX.

Output signals to the left represent messages sent via the incoming side Protocol Control, output signals to the right represent messages sent via outgoing side Protocol Control and input signals from the right represent messages received via Protocol Control or primitives from the Co-ordination Function.

Process ETS300257   Figure_C.2(8)

CFR-Idle

FACILITY
callRerouting
invoke APDU

validate
diversion request

FACILITY
callRerouting
return result or
return error APDU

········ or DISCONNECT
········ in case of CFU/CFB

N
return result
sent?

Y

stimulate establish-
ment of basic call

SETUP
divertingLeg-
Information2
invoke APDU

SS-CFNR   Y

N

FACILITY
divertionLeg-
Information1
invoke APDU

CFR-Invoked

stimulate release
to Served User
PTNX and join
remaining legs

call cleared
by Diverted-to
PTNX

ALERTING/
CONNECT from
Diverted-to
PTNX

call cleared
by Originating
or Served User
PTNX

CONNECT
from Served User
PTNX

continue alerting
of served user

FACILITY
or CONNECT
divertingLeg-
Information1

stimulate release
to Diverted-to
PTNX

FACILITY
cfnrDiverted-
LegFailed
invoke APDU

stimulate release
to Served User
PTNX and join
remaining legs

stimulate release
of both legs

CFR-Idle

Figure C.2 - SDL for Re-routing PTNX

C.3   SDL representation of SS-CF at the Served User PTNX

Figure C.3 shows the behaviour of an SS-CF Supplementary Service Control entity within the Served User PTNX.

In figure C.3, sheet 1, output signals to the left represent messages sent via the incoming side Protocol Control and input signals from the left represent messages received from the incoming side Protocol Control or primitives from the Co-ordination Function. Output signals to the right represent primitives to the served user.

In figure C.3, sheet 2, input signals from the left and from the right represent messages received via Protocol Control. Output signals to the left and to the right represent messages sent via Protocol Control. Primitives to the served user are indicated by output signals to the right. Protocol timer expiry is indicated by input signals from the right.
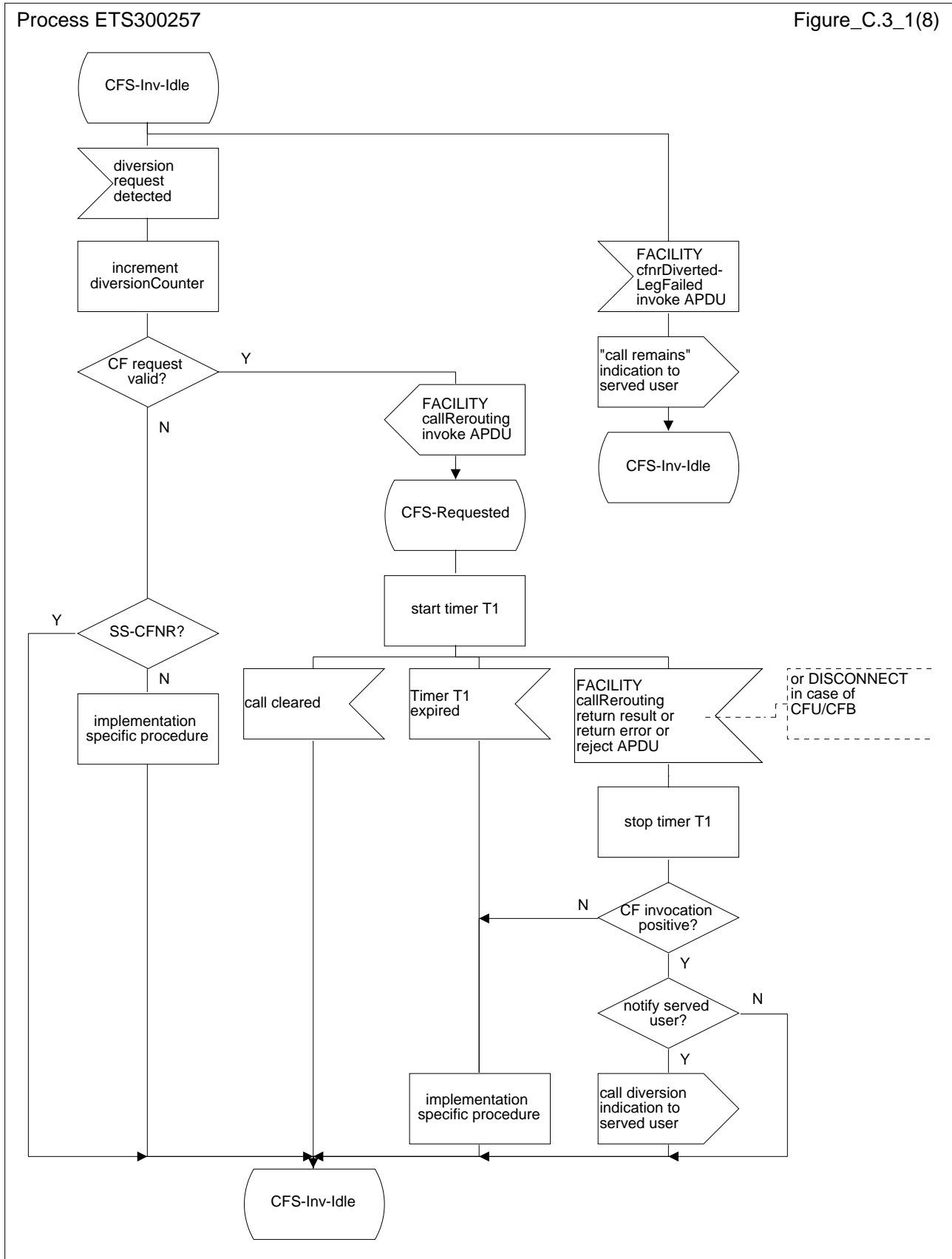
Process ETS300257   Figure_C.3_1(8)

Figure C.3 - SDL for Served User PTNX (sheet 1 of 2)

Process ETS300257   Figure_C.3_2(8)
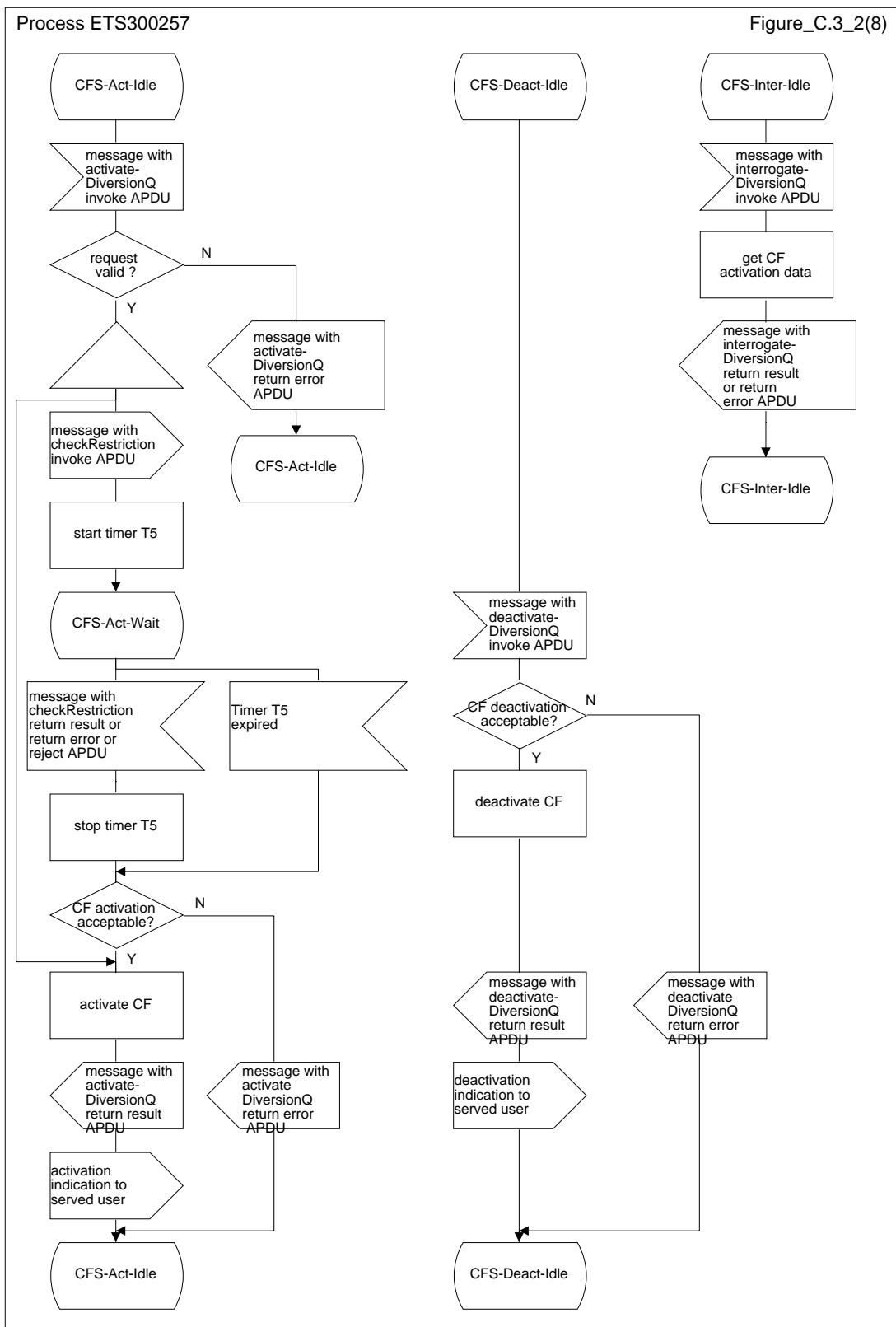
NOTE

ActivateDiversionQ, deactivateDiversionQ and interrogateDiversionQ operations are not visible at the Q reference point in case of local activation, deactivation and interrogation.

Figure C.3 - SDL for Served User PTNX (sheet 2 of 2)

C.4   SDL representation of SS-CF at the Diverted-to PTNX

Figure C.4 shows the behaviour of an SS-CF Supplementary Service Control entity within the Diverted-to PTNX.

Output signals to the left represent messages sent via Protocol Control. Output signals to the right represent primitives to the diverted-to user. Input signals from the left represent messages received via Protocol Control. Input signals from the right represent primitives from the Co-ordination Function.
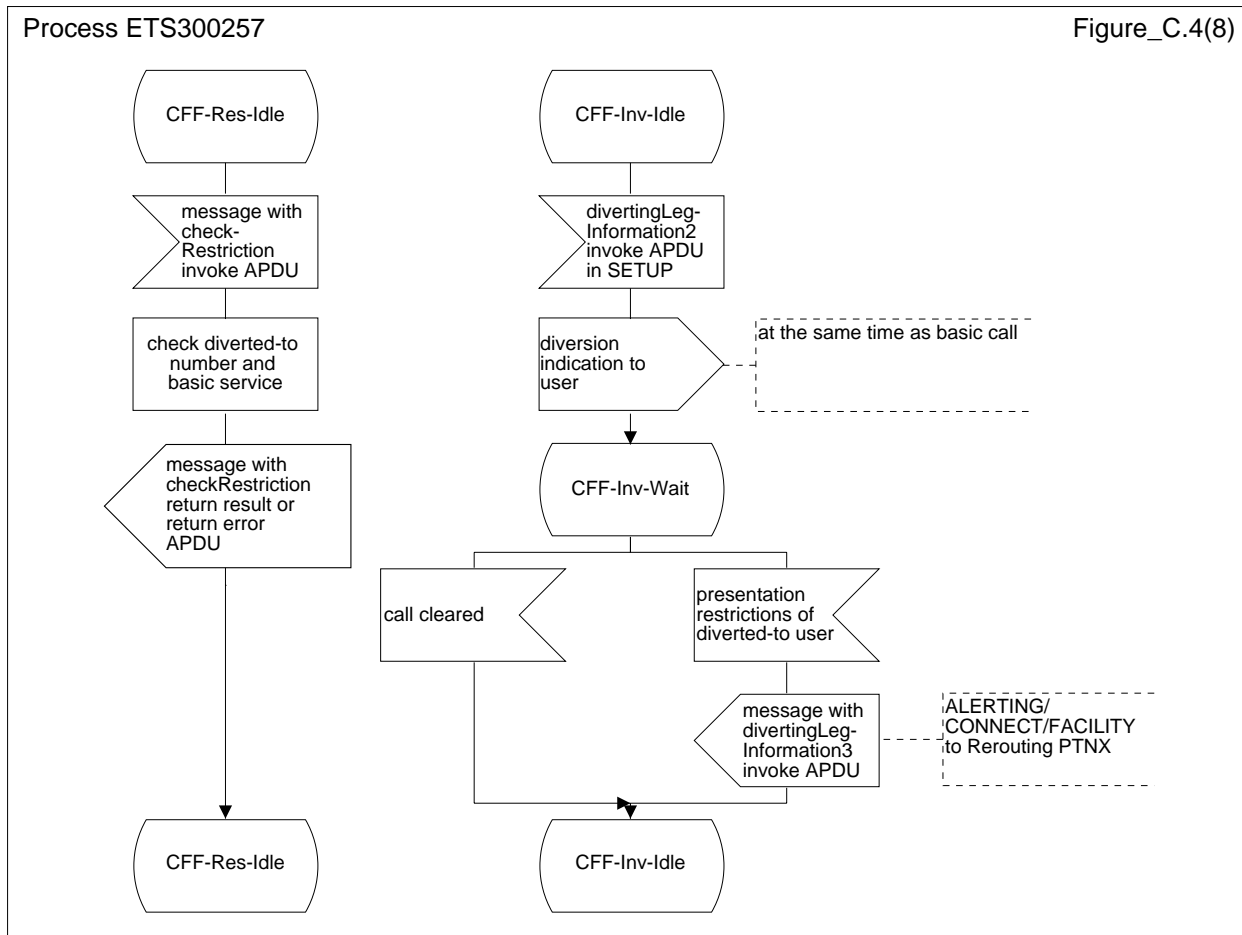
Figure C.4 - SDL for Diverted-to PTNX

C.5 SDL representation of SS-CF at the Activating PTNX

Figure C.5 shows the behaviour of an SS-CF Supplementary Service Control entity within the Activating PTNX.

Output signals to the left represent messages sent via Protocol Control and input signals from the left represent messages received via Protocol Control. Output signals to the right represent primitives to the activating user. Input signals from the right represent primitives from the activating user or timer expiry.

Process ETS300257	Figure_C.5(8)

CFA-Idle

activation request from user

start timer T2

message with activate-DiversionQ invoke APDU

CFA-Wait

message with activateDiversionQ return result or return error or reject APDU

timer expiry T2

stop timer T2

activation indication to user

CFA-Idle

NOTE

ActivateDiversionQ operations are not visible at the Q reference point in case of local activation.

Figure C.5 - SDL for Activating PTNX

C.6   SDL representation of SS-CF at the Deactivating PTNX

Figure C.6 shows the behaviour of an SS-CF Supplementary Service Control entity within the Deactivating PTNX.

Output signals to the left represent messages sent via Protocol Control and input signals from the left represent messages received via Protocol Control. Output signals to the right represent primitives to the deactivating user. Input signals from the right represent primitives from the deactivating user or timer expiry.

Process ETS300257   Figure_C.6(8)

NOTE

DeactivateDiversionQ operations are not visible at the Q reference point in case of local deactivation.

Figure C.6 - SDL for Deactivating PTNX

C.7 SDL representation of SS-CF at the Interrogating PTNX

Figure C.7 shows the behaviour of an SS-CF Supplementary Service Control entity within the Interrogating PTNX.

Output signals to the left represent messages sent via Protocol Control and input signals from the left represent messages received via Protocol Control. Output signals to the right represent primitives to the interrogating user. Input signals from the right represent primitives from the interrogating user or timer expiry.
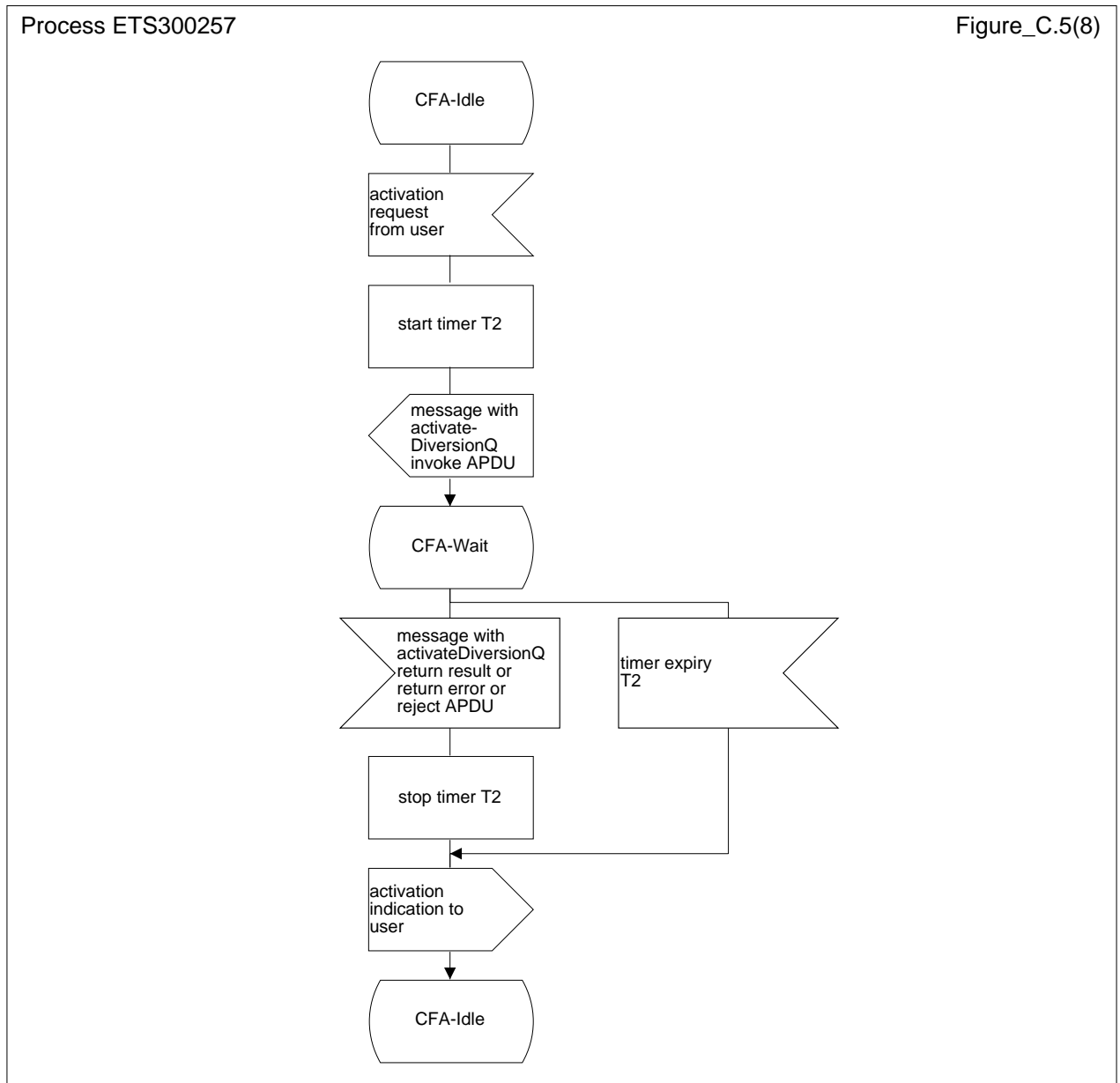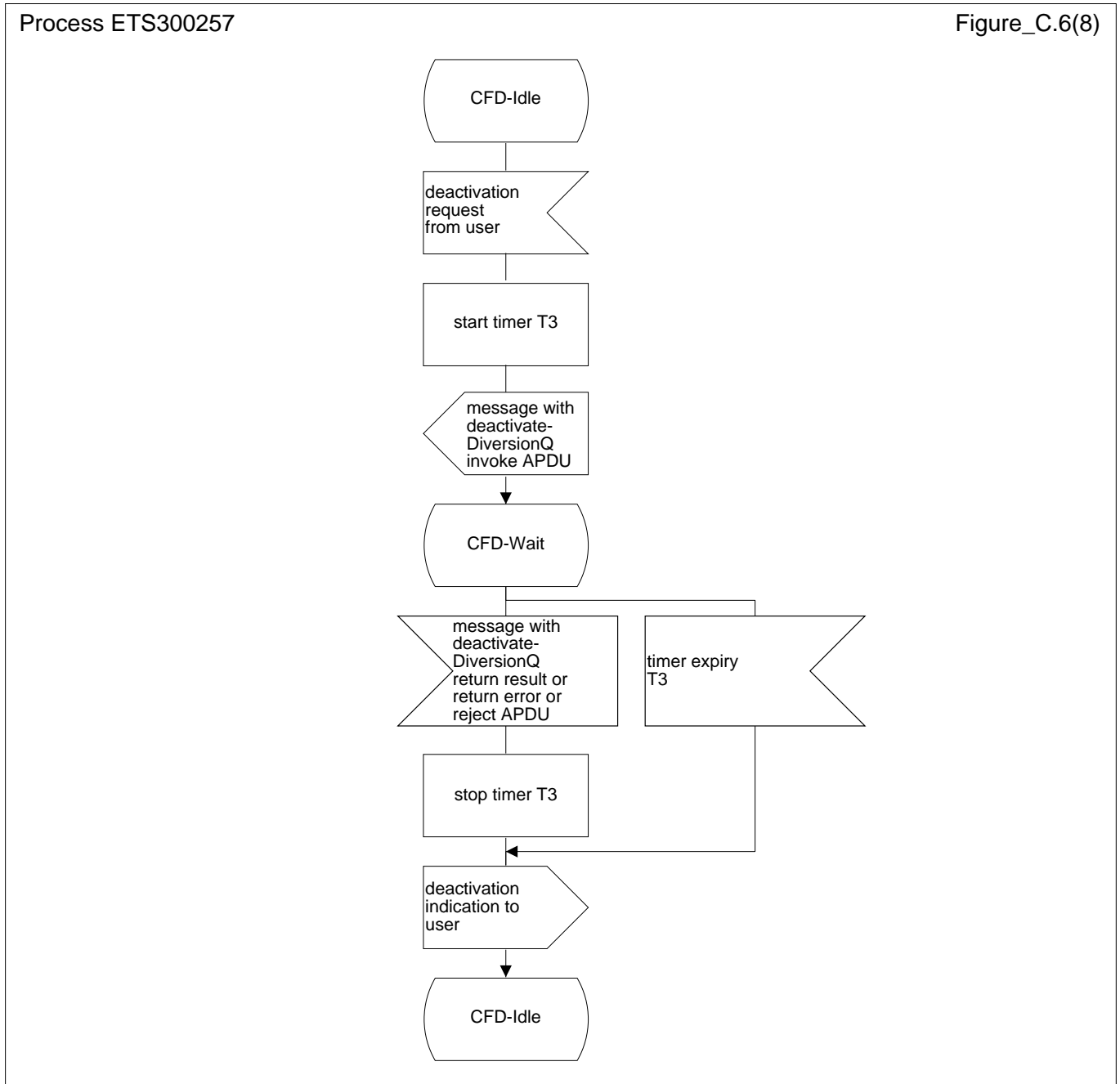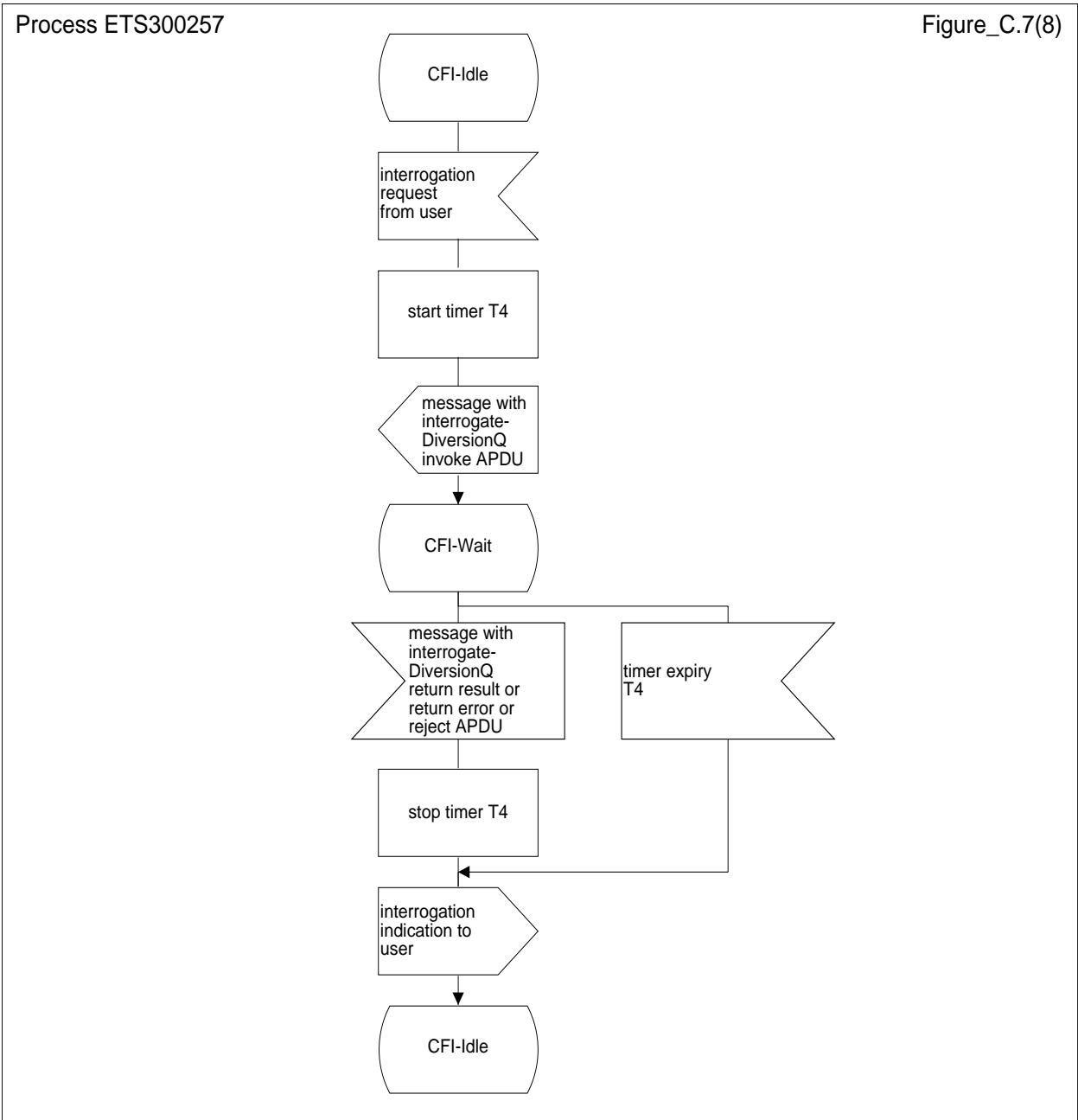

NOTE

InterrogateDiversionQ operations are not visible at the Q reference point in case of local interrogation.

Figure C.7 - SDL for Interrogating PTNX

Annex D (informative) :   Imported ASN.1 definitions

Table D.1 is an extract from module General-Errors in ETS 300 196.

Table D.1 - Imported ASN.1 definitions from General-Errors

```
notSubscribed                              ERROR :: = 0
notAvailable                               ERROR :: = 3
notImplemented                             ERROR :: = 4
invalidServedUserNr                        ERROR :: = 6
basicServiceNotProvided                    ERROR :: = 8
supplementaryServiceInteractionNotAllowed  ERROR :: = 10
resourceUnavailable                        ERROR :: = 11
```

Table D.2 is an extract from module Basic-Service-Elements in ETS 300 196.

Table D.2 - Imported ASN.1 definitions from Basic-Service-Elements

```
BasicService          :: = ENUMERATED {
                              allServices
                              (0),
                              speech
                              (1),
                              unrestrictedDigitalInformation
                              (2),
                              audio3k1Hz
                              (3),
                              unrestrictedDigitalInformationWithTonesAndAnnouncements
                              (4),
                              telephony3k1Hz
                              (32),
                              teletex
                              (33),
                              telefaxGroup4Class1
                              (34),
                              videotexSyntaxBased
                              (35),
                              videotelephony
                              (36),
                              telefaxGroup2-3
                              (37),
                              telephony7kHz
                              (38)   }
```

Table D.3 is an extract from module Diversion-Operations in ETS 300 207.

Table D.3 - Imported ASN.1 definitions from Diversion-Operations

```
invalidDivertedToNr                ERROR :: = 12
specialServiceNr                   ERROR :: = 14
diversionToServedUserNr            ERROR :: = 15
numberOfDiversionsExceeded         ERROR :: = 24
```

Table D.4 is an extract from module Addressing-Data-Elements in ETS 300 196.

Table D.4 - Imported ASN.1 definitions from Addressing-Data-Elements (sheet 1 of 2)

```
Address                    :: =   SEQUENCE {
                                  PartyNumber,
                                  PartySubaddress OPTIONAL  }

PartyNumber                :: =   CHOICE {
                                  unknownPartyNumber        [0] IMPLICIT NumberDigits,
                                  publicPartyNumber  [1] IMPLICIT PublicPartyNumber,
                                  dataPartyNumber           [3] IMPLICIT NumberDigits,
                                  telexPartyNumber          [4] IMPLICIT NumberDigits,
                                  privatePartyNumber [5] IMPLICIT PrivatePartyNumber,
                                  nationalStandardPartyNumber [8] IMPLICIT NumberDigits  }

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

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

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

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

PublicTypeOfNumber         ::=    ENUMERATED {
                                  unknown (0),
                                  internationalNumber (1),
                                  nationalNumber (2),
                                  networkSpecificNumber (3),
                                  subscriberNumber (4),
                                  abbreviatedNumber (6)  }

PartySubaddress            ::=    CHOICE {
                                  UserSpecifiedSubaddress,
                                  NSAPSubaddress  }

NSAPSubaddress             ::=    OCTET STRING (SIZE (1..20))

SubaddressInformation ::=   OCTET STRING (SIZE (1..20))

UserSpecifiedSubaddress    ::=    SEQUENCE {
                                  SubaddressInformation,
                                  oddCountIndicator BOOLEAN OPTIONAL  }
```

Table D.4 - Imported ASN.1 definitions from Addressing-Data-Elements (sheet 2 of 2)

```
PresentationAllowedIndicator ::=    BOOLEAN

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

NumberScreened              ::=    SEQUENCE {
                    PartyNumber,
                    ScreeningIndicator  }

ScreeningIndicator          ::=    ENUMERATED {
                    userProvidedNotScreened (0),
                    userProvidedVerifiedAndPassed (1),
                    userProvidedVerifiedAndFailed (2),
                    networkProvided (3)  }

PresentedNumberUnscreened ::=    CHOICE {
                    presentationAllowedNumber [0] PartyNumber,
                    presentationRestricted            [1] IMPLICIT NULL,
                    numberNotAvailableDueToInterworking [2] IMPLICIT NULL,
                    presentationRestrictedNumber     [3] PartyNumber  }
```

Table D.5 is an extract from module Name-Operations in ETS 300 238.

Table D.5 - Imported ASN.1 definitions from Name-Operations

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

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

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

NameNotAvailable

              ::=   [4] IMPLICIT NULL

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

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

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

History

Document history	
November 1993	First Edition
December 1995	Converted into Adobe Acrobat Portable Document Format (PDF)