INTERNATIONAL STANDARD

ISO/IEC
11582

First edition
1995-07-01

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Generic functional protocol for the support of supplementary services — Inter-exchange signalling procedures and protocol

Technologies de l'information — Télécommunications et échange d'informations entre systèmes — Réseau privé à intégration de services — Protocole générique fonctionnel pour le support de compléments de service — Procédures et protocole de signalisation entre commutateurs

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 11582 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

Annexes A and B form an integral part of this International Standard. Annexes C to I are for information only.

Introduction

This International Standard is one of a series of Standards defining services and signalling protocols applicable to Private Integrated Services Digital Networks (PISNs). The series uses ISDN concepts as developed by CCITT and conforms to the framework of Standards on Open Systems Interconnection as defined by ISO.

This International Standard defines the signalling protocol for use at the Q reference point between two PINXs for the transport of protocol information as part of Supplementary services and/or Additional Network Features (ANFs) within a PISN.

The generic functional procedures provide a flexible and open ended approach to the provision of Supplementary service and ANF protocols. These procedures provide:

— generic protocols which may be utilised in the provision of Supplementary services and ANFs, both related to existing calls and separate from existing calls where appropriate to the capability required;

— a dialogue identification protocol to enable Supplementary service or ANF information flows to be tied together to form a dialogue;

— Supplementary service and ANF transparency across a PISN, whereby transit PINXs need have no knowledge of the capability provided to the PISN user or PISN itself unless involved in the provision of that capability; and

— the capability for standardised and manufacturer specific capabilities to coexist in both single and multi-vendor PISNs.

The protocol defined in this International Standard is based upon that described in CCITT Recommendation Q.932 [Blue Book, 1988] including subsequent revisions during the 1989-1992 Plenary period.

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Generic functional protocol for the support of supplementary services — Inter-exchange signalling procedures and protocol

1 Scope

This International Standard defines the signalling protocol for the control of Supplementary services and Additional Network Features (ANFs) at the Q reference point. The protocol is part of Private Signalling system No. 1 (PSS1). The Q reference point exists between Private Integrated Services Network Exchanges (PINX) connected together within a Private Integrated Services Network (PISN) and is defined in ISO/IEC 11579. Detailed procedures applicable to individual Supplementary services and ANFs are beyond the scope of this International Standard and will be specified by other Standards for those services which are standardised and by individual manufacturers for proprietary services using the capabilities defined in this International Standard.

ISO/IEC 11572 defines the Layer 3 protocol for circuit-switched call control at the Q reference point. This International Standard defines additional protocol procedures, to be used in conjunction with those defined in ISO/IEC 11572 for the control of Supplementary services and ANFs.

> NOTE 1 — Typical examples of the application of these generic functional procedures to some Supplementary services are provided in Annex A, for explanatory and illustrative purposes only.

> NOTE 2 — Specific Supplementary services and Additional Network Features may require additional information transfer mechanisms which are service or feature specific and are beyond the scope of this International Standard.

2 Conformance

In order to conform to this International Standard, a PINX shall satisfy the requirements identified in the Protocol Implementation Conformance Statement (PICS) proforma in Annex A.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 11572:1994, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit mode bearer services - Inter-exchange signalling procedures and protocol.*

ISO/IEC 11574:1994, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit-mode 64 kbit/s bearer services - Service descriptions, functional model and information flows.*

ISO/IEC 11579-1:1994, *Information technology - Telecommunications and information exchange between systems - Private integrated services network - Part 1: Reference configuration for PISN Exchanges (PINX).*

CCITT Rec. I.112:1988, *Vocabulary of terms for ISDNs [Blue Book, Volume III, Fascicle III.7].*

CCITT Rec. I.210:1988, *CCITT Recommendation: Principles of Telecommunication Services Supported by an ISDN and the Means to Describe Them [Blue Book].*

CCITT Rec. X.208:1988, *Specification of Abstract Syntax Notation One (ASN.1) [Blue Book].*

CCITT Rec. X.209:1988, *Encoding Rules for Abstract Syntax Notation One (ASN.1) [Blue Book].*

CCITT Rec. X.217:1988, *Association control service definition for Open Systems Interconnection for CCITT Applications [Blue Book]*.

CCITT Rec. X.219:1988, *Remote Operations Model, Notation and Service [Blue Book]*.

CCITT Rec. X.227:1988, *Association control protocol specification for Open Systems Interconnection for CCITT Applications [Blue Book]*.

CCITT Rec. X.229:1988, *Remote Operations Protocol Specification [Blue Book]*.

4 Definitions

For the purposes of this International Standard, the following definitions apply.

4.1 External definitions

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

- Object Identifier (CCITT Rec. X.208)

- Private Integrated services Network Exchange (PINX) (ISO/IEC 11579)

- Private Integrated Services Network (ISO/IEC 11579)

- Service (CCITT Rec. I.112)

- Signalling (CCITT Rec. I.112)

- User (ISO/IEC 11574)

4.2 ACSE APDU

An APDU defined by the Association Control Service Element (ACSE).

4.3 Additional Network Feature (ANF)

A capability provided by a PISN, not generally directly to a User, over and above that of the Basic call.

4.4 Adjacent PINX

A PINX as considered from another PINX to which it is directly connected via one or more inter-PINX links.

4.5 Application Protocol Data Unit (APDU)

A sequence of data elements exchanged between peer application layer entities, e.g. ACSE APDUs, DSE APDUs and ROSE APDUs

4.6 Call, Basic call

An instance of the use of a basic service.

4.7 Call independent signalling connection

A signalling connection established between SS-Control entities located in different PINXs that does not have an associated user-information connection.

4.8 Call independent

A property of information which is conveyed across the Q reference point in a message which does not use a call reference which has an associated user-information connection (that is, using a Connectionless or Connection oriented transport mechanism as defined in 7.2 or 7.3).

4.9 Call related

A property of information which is conveyed across the Q reference point in a message which uses a call reference which has an associated user-information connection.

4.10 Connection oriented

Communication between peer protocol entities by means of a connection or association established by an underlying layer.

4.11 Connectionless

Communication between peer protocol entities by means of an unacknowledged, unidirectional transport mechanism provided by an underlying layer.

4.12 Coordination Function

An entity which provides coordination between various SS-Control entities, ROSE, ACSE, DSE, GFT-Control and Call Control for different Supplementary services (see clause 6).

4.13 Destination PINX

In the context of a single one-way exchange of information between two SS-Control entities, the PINX where the receiving SS-Control entity is located.

4.14 DSE APDU

An APDU defined by the Dialogue Service Element.

4.15 Dialogue Service Element (DSE)

A service element which provides services to SS-Control via the Coordination Function that associate ROSE or ACSE APDUs which are not implicitly associated by an underlying network layer connection.

4.16 End PINX

In the context of a particular call, an Originating or Terminating PINX. It can also be a Gateway PINX, dependent on the capabilities of the signalling system being interworked (i.e. unless it transports APDUs unchanged to or from the other signalling system).

4.17 Gateway PINX

Sub-clause 4.6 of ISO/IEC 11572 shall apply. Dependent on the capabilities of the signalling system being interworked by the Gateway PINX, it can act as a Transit or an End PINX in the context of the Supplementary services

APDUs. That is, it can either transport the APDUs unchanged to or from the other signalling system, perhaps embedded in some other protocol unit, or process the APDUs and perform an interworking function of the information flows and encoding of the Supplementary service concerned.

4.18 Generic Functional Transport Control (GFT-Control) entity

The entity that exists within a PINX and provides a range of services (defined in clause 6) to SS-Control, ROSE, ACSE and DSE via the Coordination Function.

4.19 Incoming side

In the context of a Call independent signalling connection, the Side which receives the request for connection establishment from the Preceding PINX.

4.20 Interpretation APDU

An APDU defined by the Coordination Function.

4.21 Inter-PINX link

The totality of a signalling channel and a number (≥ 0) of user information channels (which may have different characteristics) at the Q reference point.

4.22 Invocation

A request by a SS-Control entity to perform an operation in a remote SS-Control entity.

4.23 Link significance

A property of a Facility information element which does not contain a Network Facility Extension octet group. It indicates that the element has only significance on a single inter-PINX link - i.e. only between two Adjacent PINXs.

4.24 Mistyped

A property of an APDU whose structure does not conform to the structure defined in clause 11 of this International Standard or the structure defined for a particular Supplementary service.

4.25 Network significance

A property of a Facility information element which includes a Network Facility Extension octet group. It indicates that the element has significance between two PINXs which are not necessarily Adjacent.

4.26 Next PINX

An Adjacent PINX to which an APDU is to be sent in the context of an existing signalling connection (related to a call or independent of a call).

4.27 Notification

A piece of protocol information which has the following properties:

— it is intended to be delivered only to terminals and is therefore passed on transparently by PINXs;

— it does not cause a change of state on either side of the Q reference point;

— it represents a one-way flow of information that requires no response; and

— it provides additional information that can be discarded without the need for significant error recovery if it is unrecognised by the terminal.

4.28 Originating PINX

Sub-clause 4.5 of ISO/IEC 11572 shall apply. In addition, the term is also applied to a PINX which originates a Call independent signalling connection.

4.29 Outgoing side

In the context of a Call independent signalling connection, the Side which sends the request for connection establishment to the Next PINX.

4.30 Preceding PINX

Sub-clause 4.7 of ISO/IEC 11572 shall apply. In addition, the term is also applied in a similar way to a PINX participating in a Call independent signalling connection.

4.31 Private Signalling System No.1

The generic name given to the signalling protocol that exists conceptually at the 'Q' reference point and is defined in this and other Standards. This protocol is visible and indirectly testable at the 'C' reference point (see ISO/IEC 11579).

4.32 Protocol Control

An entity which exists within a PINX and provides a range of services (defined in clause 6) to the Generic Functional Transport Control entity.

4.33 ROSE APDU

An APDU defined by the Remote Operations Service Element (ROSE).

4.34 Side

The Protocol Control entity within a PINX at one end of an inter-PINX link.

4.35 Signalling Carriage Mechanism (SCM)

The infrastructure that transports messages between Protocol Control entities in two interconnected PINXs.

4.36 Source PINX

In the context of a single one-way exchange of information between two SS-Control entities, the PINX where the sending SS-Control entity is located.

4.37 Subsequent PINX

Sub-clause 4.7 of ISO/IEC 11572 shall apply. In addition, the term is also applied in a similar way to a PINX participating in a Call independent signalling connection.

4.38 Supplementary service

Section 2.4 of CCITT Recommendation I.210 shall apply.

For the purpose of this International Standard, ANFs shall be regarded as Supplementary services.

4.39 Supplementary Services Control (SS-Control) entity

An entity that exists within a PINX and provides the procedures associated with the support of a particular Supplementary service.

4.40 Terminating PINX

Sub-clause 4.5 of ISO/IEC 11572 shall apply. In addition, the term is also applied to a PINX which terminates a Call independent signalling connection.

4.41 Terminal, Terminal Equipment

An item of equipment attached to a telecommunication network to provide access for a user to one or more services.

4.42 Transit PINX

Sub-clause 4.5 of ISO/IEC 11572 shall apply. In addition, the term is also applied to a PINX which participates in the provision of a Call independent signalling connection, but does not originate or terminate that connection.

4.43 Unrecognised

A property of a message, information element, APDU or operation value whose type identifier is not one supported by the Destination PINX.

5 List of acronyms

ACSE	Association Control Service Element
AE	Application Entity
ANF	Additional Network Feature
APDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation One
BER	Basic Encoding Rules
DSE	Dialogue Service Element
DSS1	Digital Subscriber Signalling no. 1
FIE	Facility information element
GFT	Generic Functional Transport
ICD	International Code Designator
MSI	Manufacturer Specific Information
NFE	Network Facility Extension
PC	Protocol Control

PICS	Protocol Implementation Conformance Statement
PISN	Private Integrated Services Network
PINX	Private Integrated services Network Exchange
PSS1	Private Signalling System no. 1
RO	Remote Operations
ROSE	Remote Operations Service Element
RTSE	Reliable Transfer Service Element
SCM	Signalling Carriage Mechanism
SS	Supplementary Service

6 General principles

The generic functional protocol defined in this International Standard provides the means to exchange signalling information for the control of Supplementary services over a PISN. It does not by itself control any Supplementary service but rather provides generic services to specific SS-Control entities. Procedures for individual Supplementary services based on these generic procedures are defined in other standards or may be manufacturer-specific.

The generic functional protocol operates at the Q reference point between two PINXs in conjunction with a Layer 3 protocol for Basic call control (ISO/IEC 11572). Together these use the services of the Signalling Carriage Mechanism (SCM).

The generic functional protocol provides mechanisms for the support of Supplementary services which relate to existing basic calls or are entirely independent of any existing basic calls. In performing a Supplementary service, whether Call independent or Call related, use may be made of both the Call related (7.1) and Call independent (7.2 and 7.3) information transfer procedures.

If a particular Supplementary service comprises Call related and Call independent information transfer procedures or relates to several basic calls at the same time it is - for the purpose of this International Standard - deemed to consist of separate instances of Call related (one for each call) and Call independent services respectively. The combined use of two or more instances of Call related and/or Call independent procedures in support of a particular Supplementary service is outside the scope of this International Standard.

6.1 Application Association

Supplementary service operations require an association between the respective peer SS-Control entities. This International Standard provides three means by which this association can be achieved:

   a) implicitly by the network layer connection in the case of Call related connections and for call-independent signalling connections;

   b) implicitly by the application layer dialogue service, in which case the association is independent of the underlying network layer connections and can use a combination of different mechanisms, including Call

independent Connectionless information transfer or,

c) explicitly by use of the Association Control Service Element (ACSE, X.217/227) in conjunction with the underlying mechanisms provided in (a) and (b).

6.2 Protocol Model

Figure 1 shows the conceptual model for the generic functional protocol and its relation to the Basic call model defined in ISO/IEC 11572.

At the top layer (the application layer) the actual Supplementary service protocol operates between peer Supplementary Services Control (SS-Control) entities which are service-specific. The operation of specific SS-Control entities is beyond the scope of this International Standard.

SS-Control entities use the services of the Remote Operations Service Element (ROSE), the Association Control Service Element (ACSE) and the Dialogue Service Element (DSE) at the application layer via the Coordination Function. These entities use the services of Generic Func-

tional Transport Control (GFT-Control) at the network layer via the Coordination Function. GFT-Control uses the services of Protocol Control at the network layer.

The Remote Operations Service Element (ROSE) is defined in CCITT Rec. X.219.

The Association Control Service Element (ACSE) is defined in CCITT Rec. X.217.

> NOTE — In the application of ROSE for the support of Supplementary services in PSS1 the underlying services used by ROSE are those provided by GFT-Control or those provided by the Association Control Service Entity (ACSE). No use is made of the services of the Reliable Transport Service Element(RTSE).

The Dialogue Service Element (DSE) provides a means of associating ACSE or ROSE APDUs which are not implicitly associated by an underlying network layer connection.

The Coordination Function provides coordination between
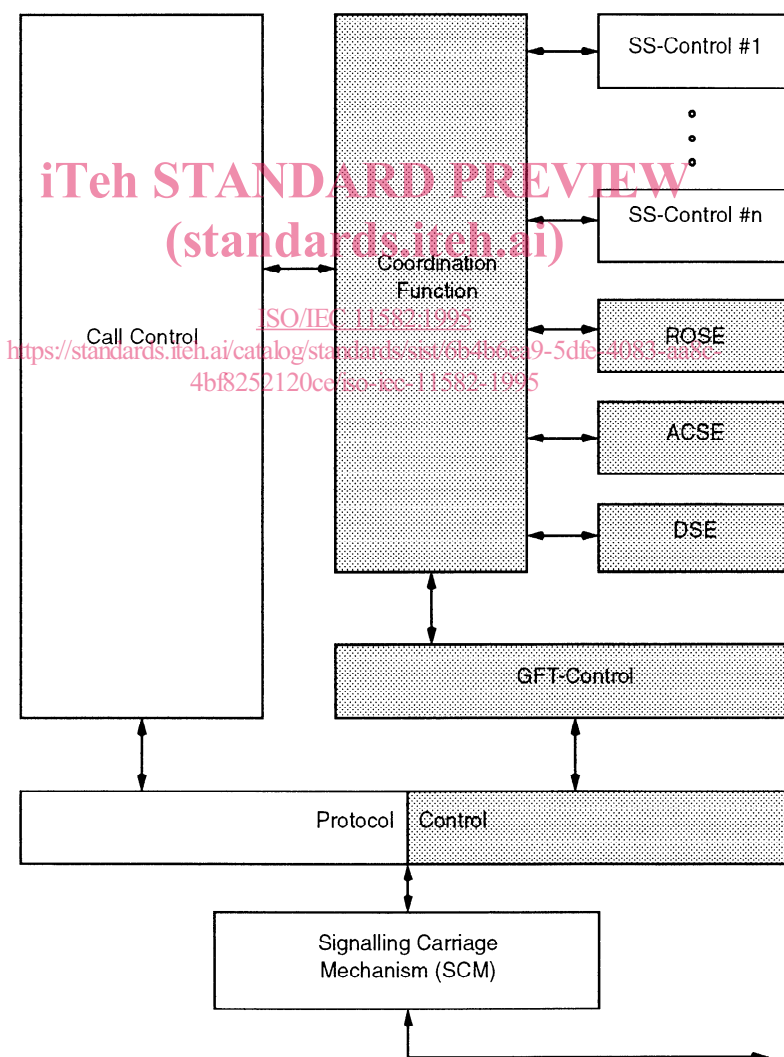
NOTE — The capabilities defined in this International Standard are indicated by shading, i.e. GFT-Control, DSE, ACSE, ROSE and extensions to Protocol Control. Part of the functions of the Coordination Function are also defined in this International Standard, but the remainder of this element governs Supplementary service specific interactions which are beyond the scope of this International Standard.

Figure 1 — PSS1 Protocol Model

GFT-Control, the various SS-Control entities, ROSE, ACSE, DSE and Call Control for different Supplementary services. The relationships it coordinates are beyond the scope of this International Standard. It also provides functions to support the handling of unrecognised APDUs.

GFT-Control provides two distinct types of service via the Coordination Function:

— transport services for the carriage of Notifications, ROSE APDUs, ACSE APDUs and DSE APDUs between SS-Control entities in different PINXs, including transparent relaying through Transit PINXs. These services can be related to a Call or independent of a Call; and,

— establishment and release of Call independent signalling connections.

Protocol Control is an extension of the existing Protocol Control entity. It provides services to GFT-Control for:

— the transport of APDUs between Adjacent PINXs;

— the establishment and release of signalling connections (Call independent Connection oriented service) between Adjacent PINXs.

This entity builds on the ISO/IEC 11572 (Basic call) Protocol Control in the following way:

— the Call related transfer of APDUs uses the call reference established for the call by Protocol Control. This can be either by:

• the combination of Basic call control information

and APDUs in the same ISO/IEC 11572 message if they appear concurrently at the Protocol Control service access points; or,

• the transfer of APDUs in a message defined in this International Standard associated with the call reference, when no Call Control primitive appears at the Protocol Control service access point.

— Call independent signalling connections use the call reference mechanism of Protocol Control and some of the messages and procedures.

6.3 Application of the protocol model to communication between SS-Control entities in non-Adjacent PINXs

Figure 2 shows the application of the protocol model to the case where communication occurs between SS-Control entities in two PINXs via a single Transit PINX. It may be applied to communication via more than one Transit PINX by simple replication.

In figure 2, relaying functions at the Transit PINX are performed by GFT-Control.

If communication is Call related, each of the PINXs in which the SS-Control entities are located may be either an End or a Transit PINX. For simplicity, the Call Control entities are not shown.

If communication is in the context of a Call independent signalling connection, one of the PINXs in which the SS-Control entities are located is the Originating PINX and the
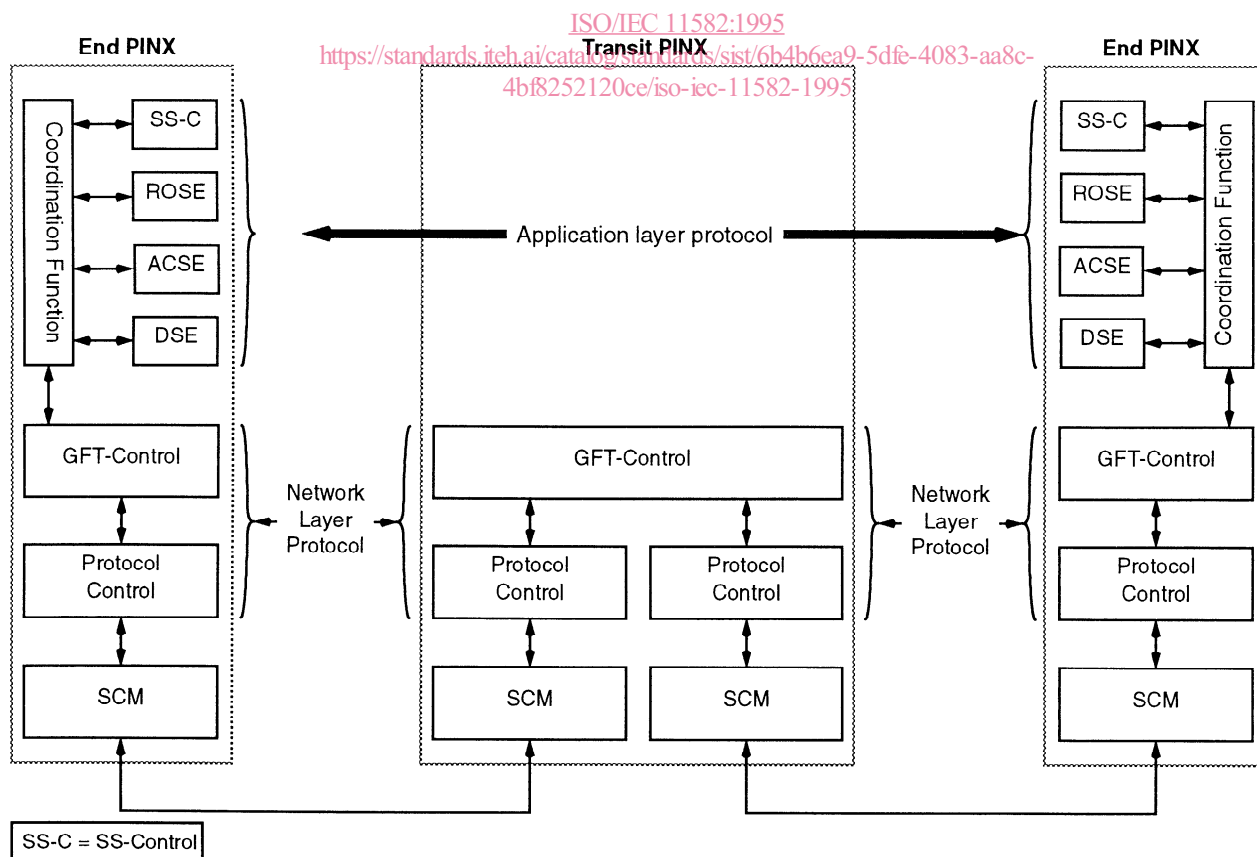
Figure 2 — Application of the protocol model to communication between non-Adjacent PINXs

other is the Terminating PINX.

The Signalling Carriage Mechanism (SCM) is described in ISO/IEC 11572.

6.4 Services provided by ROSE

ROSE provides a set of services to SS-Control to support the ROSE protocol. Primitives for these services are specified in X.219 and relate to the following ROSE APDUs: Invoke, ReturnResult, ReturnError and Reject.

6.5 Services provided by ACSE

ACSE provides a set of services to establish and release an explicit Application association. Primitives for these services are specified in X.217 and relate to the following ACSE APDUs: Associate request, Associate response, Release request, Release response and Abort.

6.6 Services provided by DSE

DSE provides the services shown in Table 1 to SS-Control via the Coordination Function, with their contents indicated as either Mandatory (M) or Optional (O). These services are used for creating and terminating a Dialogue which associates peer SS-Control entities and for exchanging ACSE or ROSE APDUs within such an association.

Table 1 — Services provided by DSE

- **Dialog Begin**	Req/Ind
Originating Dialog Identifier	M
ROSE APDU(s) (Note)	O
- **Dialog Continue**	Req/Ind
Originating Dialog Identifier	M
Destination Dialog Identifier	M
ROSE APDU(s) (Note)	O
- **Dialog End**	Req/Ind
Destination Dialog Identifier	M
ROSE APDU(s) (Note)	O
- **Dialog Abort**	Req/Ind
Destination Dialog Identifier	M
User Abort Cause	M

NOTE — This element can contain one or more ACSE or ROSE APDUs

6.7 Services provided by GFT-Control

This entity provides the following services to SS-Control, ACSE, ROSE and DSE via the Coordination Function, with their contents indicated as either Mandatory (M) or Optional (O).

6.7.1 Connection oriented services

The services shown in Table 2 are provided for the control of the establishment and clearing of a Call independent signalling connection between the PINXs in which the peer SS-Control entities exist.

NOTE 1 — It is envisaged that the majority of Supplementary services requiring call independent APDU transport will make use of a Call independent signalling connection via the use of the services shown in Tables 2 and 3.

Table 2 — Connection oriented services

- **GF-Setup**	Req/Ind	Resp/Conf
Origination Address	O	-
Destination Address	M	O
Data (Note 2)	O	O
- **GF-Release**	Req/Ind	
Cause	M	
Data (Note 2)	O	
- **GF-Reject**	Req/Ind	
Cause	M	
Data (Note 2)	O	

NOTE 2 — This element shall contain one or more APDUs and an indication of the destination of these APDUs on the connection path. APDUs may be ACSE APDUs, DSE APDUs or ROSE APDUs. It may also contain an interpretation APDU generated by the Coordination Function.

The service shown in Table 3 is provided and is used for the conveyance of APDUs on a signalling connection (Call related or Call independent) between the PINXs in which the peer SS-Control entities exist.

Table 3 — Connection oriented services

- **GF-Data**	Req/Ind
Data (Note 3)	M
Basic Call Correlation (Note 4)	O

NOTE 3 — This element shall contain one or more APDUs and an indication of the destination of these APDUs on the connection path. APDUs may be ACSE APDUs, DSE APDUs or ROSE APDUs. It may also contain an interpretation APDU generated by the Coordination Function

NOTE 4 — This element shall be included if SS-Control requires that the Data to be conveyed is to be conveyed in conjunction with a specific basic call control message.

6.7.2 Connectionless transport services

The service shown in Table 4 is provided to effect the transport of APDUs between two peer SS-Control entities without the use of a network layer connection. It is an unconfirmed service.

Table 4 — Connectionless services

- **GF-Unitdata**	Req/Ind
Origination Address	M
Destination Address	M
Data (Note)	M

NOTE — This element shall contain one or more APDUs. APDUs may be ACSE APDUs, DSE APDUs or ROSE APDUs. It may also contain an interpretation APDU generated by the

Coordination Function

6.7.3 Notification services

The service in Table 5 is provided to SS-Control via the Coordination Function. This service is used to effect the transport of notifications associated with the network layer signalling connection of a Call.

Table 5 — Notification services

- **GF-Notify**	Req/Ind
Notification	M
Basic Call Correlation (Note)	O

NOTE — This element shall be included if SS-Control requires that the Notification is conveyed in conjunction with a specific basic call control message.

6.8 Services provided by Protocol Control to GFT-Control

The following services are provided, with their contents indicated as either Mandatory (M) or Optional (O).

6.8.1 Connection oriented transport services

The services in Table 6 provide the Connection oriented network service for Call independent Supplementary service control. These services are used for the establishment and clearing of Call independent signalling connections between Adjacent PINXs.

Table 6 — Connection oriented transport services

- **PC-Setup**	Req/Ind	Resp/Conf
Origination Address	O	-
Destination Address	M	O
Data (Note 1)	O	O
- **PC-Release**	Req/Ind	
Cause	M	
Data (Note 1)	O	
- **PC-Reject**	Req/Ind	
Cause	M	
Data (Note 1)	O	

NOTE 1 — This element shall contain one or more APDUs and an indication of the destination of these APDUs on the connection path.

NOTE 2 — These primitives are similar to the primitives defined in 6.2 of ISO/IEC 11572 for provision of services to Call Control.

The service in Table 7 is provided to GFT-Control for the conveyance of APDUs between Adjacent PINXs in association with a Basic call or Call independent signalling connection.

Table 7 — Connection oriented transport services

- **PC-Data**	Req/Ind
Data (Note 3)	M
Basic Call Correlation (Note 4)	O

NOTE 3 — This element shall contain one or more APDUs and an indication of the destination of these APDUs on the connection path.

NOTE 4 — This element shall be included if the APDUs to be conveyed are to be conveyed in conjunction with a specific basic call control message.

6.8.2 Connectionless transport service

The service in Table 8 is provided to GFT-Control to effect the transport of APDUs between two Adjacent PINXs without the use of a network layer connection.

Table 8 — Connectionless transport services

- **PC-Unitdata**	Req/Ind
Origination Address	M
Destination Address	M
Data (Note)	M

NOTE — This element shall contain one or more APDUs.

6.8.3 Notification services

The service in Table 9 is provided to GFT-Control. This service is used to effect the transport of notifications between Adjacent PINXs in association with the network layer signalling connection of a Call.

Table 9 — Notification transport services

- **PC-Notify**	Req/Ind
Notification	M
Basic Call Correlation (Note)	O

NOTE — This element shall be included if the Notification is to be conveyed in conjunction with a specific basic call control message.

6.9 Services required of the Signalling Carriage Mechanism

The services required by Protocol Control are as specified in 6.3 of ISO/IEC 11572.

7 Protocol Control and GFT-Control Requirements

7.1 Call related Procedures for the transport of APDUs

This clause describes the procedures required to transport Call related APDUs.

NOTE — The APDUs need not directly relate to the provision or state of the Call which provides the signalling connection over which the information is carried. If the Call fails and the connection is cleared down for any reason, APDUs that are in the process of being sent may never reach their destination. In such a case, the APDUs will be discarded. It is the responsibility of the Supplementary service protocol to cater for this eventuality.

7.1.1 Protocol Control requirements

7.1.1.1 Sending the Facility information element

When requested by GFT-Control, the Facility information element may be sent at any time during a call (i.e. where a call reference exists) subject to the following conditions:

— If a call establishment or a call clearing message that may contain a Facility information element (see clause 10) or a PROGRESS message is to be sent in the context of a Basic call and GFT-Control has requested that the Facility information element be carried in that message, the Facility information element shall be included in that message.

— otherwise, the Facility information element shall be carried in a FACILITY message.

Three exceptions where the Facility information element shall not be sent and an indication of transmission failure given to GFT-Control are:

— when no response has been received to a previously sent SETUP message (as defined in 10.1 of ISO/IEC 11572);

— when no response has been sent to a previously received SETUP message (as defined in 10.1 of ISO/IEC 11572);

— when the Facility information element is of network significance and a call clearing message has already been sent or received on the inter-PINX link; or

— if no call establishment or clearing message is to be sent and a RELEASE or RELEASE COMPLETE message has been sent or received on the inter-PINX link.

NOTE 1 — Further actions by the GFT-Control entity in such a situation (e.g. if the Facility information element was received from the Subsequent PINX) are implementation dependent. In designing protocols for Supplementary services in a PISN, account should be taken of the fact that an end to end Call related signalling relationship cannot be guaranteed until the receipt of the first end to end Basic call message.

NOTE 2 — In the case where the Facility information element is sent to a PINX which does not conform to this International Standard, the Facility information element will be

discarded by that PINX and a STATUS message may be received (see clause 9 in ISO/IEC 11572). The STATUS message will indicate that either: the Facility information element was unrecognised; or, that the message (FACILITY) was unrecognised. In such cases, the recovery action, if any, is an implementation specific matter.

7.1.1.2 Receiving the Facility information element

A PINX receiving a Facility information element in a valid call clearing or call establishment message (see clause 10) or a PROGRESS or FACILITY message shall pass the entire contents of that information element to GFT-Control.

Protocol Control shall treat any value in octets 3.1 onwards as valid, and therefore the ISO/IEC 11572 procedures for information elements with invalid contents shall not apply to these octets.

7.1.2 GFT-Control requirements

7.1.2.1 Actions at a Source PINX

On receipt of a request for APDU transport from the Coordination Function, the APDUs to be transported shall be encoded in a Facility information element, as defined in 11.3.3.

APDUs may be of two basic types:

— Those which have only Link significance, i.e. over a single link of the PISN, between two Adjacent PINXs; or,

— Those which have Network significance, between two PINXs in the PISN which are not necessarily adjacent, and which can be, but need not be, the End PINXs involved in the call.

If the APDUs have link significance, the Network Facility Extension (NFE), defined in 11.3.3.1, need not be included in the Facility information element (although it may optionally be included, explicitly identifying the Adjacent PINX);

If the APDUs have network significance, the NFE shall be included, encoded as described in table 10.

NOTE 1 — The Facility information element may contain one or more APDUs. If more than one APDU is contained in a single Facility information element, they will all be processed by the Destination PINX. How and if these requests are related is beyond the scope of this International Standard.

The Facility information element shall be delivered to Protocol Control.

7.1.2.2 Actions at a Receiving PINX

A PINX receiving a Facility information element (in one of the messages listed in clause 10) shall determine whether or not it is the Destination PINX for that Facility information element.

It shall accomplish this by determining whether the Protocol Profile (octet 3) has the value 'Networking Extensions' and if so, whether octet 3 is immediately followed by an NFE (as determined by the tag value).

If the Facility information element does not contain an NFE, the PINX shall become the Destination PINX for that Facility information element.

If the Facility information element contains an NFE, the PINX shall determine whether it is a Transit PINX or End PINX in the context of the Basic call and act as described below.

7.1.2.2.1 End PINX actions

If the receiving PINX is an End PINX, and the encoding of the received NFE complies with the encoding and structure defined in clause 11, the following actions shall apply:

— if the destinationEntity element of the NFE indicates endPINX or anyTypeOfPINX and no destinationEntityAddress element is included, it shall become the Destination PINX for that Facility information element;

— if the destinationEntity element of the NFE indicates anyTypeOfPINX and includes a destinationEntityAddress element, it shall compare the received address to its own address. If the addresses match, the PINX shall become the Destination PINX for that Facility information element;

— if the destinationEntity element of the NFE indicates endPINX and erroneously includes a

destinationEntityAddress element, the PINX shall become the Destination PINX for that Facility information element;

— in all other cases, the received Facility information element shall be discarded.

If the received NFE does not conform to the encoding and structure defined in clause 11, the entire Facility information element shall be discarded.

7.1.2.2.2 Transit PINX actions

If the receiving PINX is a Transit PINX, and the encoding of the received NFE complies with the encoding and structure defined in clause 11, the following actions shall apply:

— if the destinationEntity element of the NFE indicates anyTypeOfPINX and a destinationEntityAddress element is included, it shall compare the received address to its own address. If the addresses match, the PINX shall become the Destination PINX for that Facility information element;

— if the destinationEntity element of the NFE indicates anyTypeOfPINX and no destinationEntityAddress element is included, the PINX may become the Destination PINX for that Facility information element if it understands the contents;

— if the destinationEntity element of the NFE indicates

Table 10 — Encoding of NFE

Case No.	Communication between ..	Required coding of NetworkFacilityExtension for each identified case			
		Encoding of sourceEntity	Encoding of sourceEntityAddress	Encoding of destinationEntity	Encoding of destinationEntityAddress
1	End PINX (Originating or Terminating) => End PINX (Terminating or Originating, depending on direction of FIE)	endPINX (Note)	NOT included	endPINX	NOT included
2	End PINX (Originating or Terminating) => addressed PINX	endPINX (Note)	NOT included	anyTypeOfPINX	PINX Address
3	End PINX (Originating or Terminating) => Next PINX which understands contents	endPINX (Note)	NOT included	anyTypeOfPINX	NOT included
4	Transit PINX => Terminating or Originating PINX (depending on direction of FIE)	anyTypeOfPINX	PINX Address	endPINX	NOT included
5	Transit PINX => addressed PINX	anyTypeOfPINX	PINX Address	anyTypeOfPINX	PINX Address
6	Transit PINX => addressed PINX	anyTypeOfPINX	PINX Address	anyTypeOfPINX	NOT included

NOTE — The value endPINX for the sourceEntity should be avoided if there is any possibility that the PINX can cease to be an End PINX (e.g. through the use of certain Supplementary services) prior to a response (e.g. a Reject APDU) being received.

endPINX and erroneously includes a destinationEntityAddress element, the PINX shall ignore the contents of the destinationEntityAddress field and treat the contents of the Facility information element as if only the destinationEntity element was present;

— if the destinationEntity element of the NFE indicates endPINX, and the Transit PINX is capable of acting as an End PINX for all services indicated in the Facility information element, it may become the Destination PINX for that Facility information element.;

NOTE 1 — In this case, the source of the information will have no knowledge that the information has been intercepted, as the Transit PINX will act as if it were an End PINX. This may occur, for example, when a PINX at a PISN numbering domain boundary wishes to translate numbering information contained within an APDU.

— in all cases where the PINX does not become the Destination PINX, the Facility information element shall be passed on unchanged to the Next PINX.

If the received NFE does not conform to the encoding and structure defined in clause 11, the entire Facility information element shall be discarded and no Facility information element shall be passed on to the Next PINX.

NOTE 2 — Processing of a Facility information element at a Transit PINX does not preclude another Facility information element, which may have similar contents to that received by the Transit PINX, being sent to the Next PINX as a result of that internal processing.

7.1.2.3 Actions at a Destination PINX

All APDUs in the received Facility information element shall be delivered to the Coordination Function at a Destination PINX in the order in which they were received in the Facility information element together with an indication of the pro-

tocol profile.

If the Protocol Profile (octet 3) in the received Facility information element does not indicate 'Networking Extensions', the indication of the protocol profile to the Coordination Function shall reflect the contents of the Protocol Profile.

If the Protocol profile (octet 3) in the received Facility information element indicates 'Networking Extensions', and a Network Protocol Profile (as determined by the tag value) is present in the received Facility information element immediately following the NFE, if present, or immediately following octet 3, the indication of protocol profile to the Coordination Function shall reflect the contents of the Network Protocol Profile.

If the Protocol profile (octet 3) in the received Facility information element indicates 'Networking Extensions', and a Network Protocol Profile is not present in the received Facility information element, the indication of protocol profile to the Coordination Function shall be the default (ROSE).

The Facility information element shall be discarded under any of the following circumstances:

— the Network Protocol Profile is present but incorrectly coded;

— subsequent octets do not comprise one or more concatenated APDUs, each in the form of an encoded ASN.1 value (comprising tag, length and contents).

7.1.2.4 Dynamic description (SDL) of Generic Functional Transport Control

Figures 4 and 5 show SDL diagrams describing the actions of the GFT-Control entity, as specified in 7.1.2. Figure 3 is the key to these SDL diagrams.

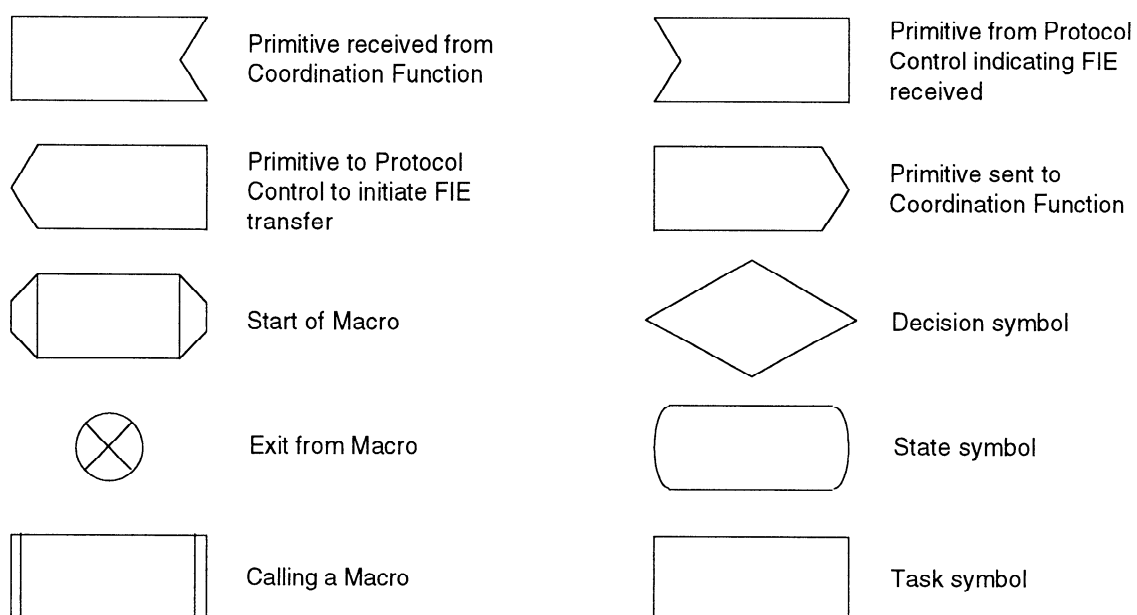|	
Primitive received from Coordination Function	Primitive from Protocol Control indicating FIE received
Primitive to Protocol Control to initiate FIE transfer	Primitive sent to Coordination Function
Start of Macro	Decision symbol
Exit from Macro	State symbol
Calling a Macro	Task symbol

Figure 3 — Key to SDL diagrams in figures 4, 5, 6 and 7.