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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of the joint technical committee is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 11582 was prepared by ECMA (as ECMA-165) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

This second edition cancels and replaces the first edition (ISO/IEC 11582:1995), which has been technically revised.

Annexes A and B form a normative part of this International Standard. Annexes C to L are for information only.

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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 ITU-T and conforms to the framework of International Standards on Open Systems Interconnection as defined by ISO/IEC.

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 protocol defined in this International Standard forms part of the PSS1 protocol (informally known as QSIG).

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 ITU-T Recommendation Q.932 (1993).

This International Standard is based upon the practical experience of ECMA member companies and the results of their active and continuous participation in the work of ISO/IEC JTC 1, ITU-T, ETSI and other international and national standardization bodies. It represents a pragmatic and widely based consensus.

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), known informally as QSIG. The Q reference point exists between Private Integrated services Network eXchanges (PINXs) connected together within a Private Integrated Services Network (PISN) and is defined in ISO/IEC 11579-1. 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 C, 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 normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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)*

ISO/IEC 11574:2000, *Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Circuit-mode 64 kbit/s bearer services — Service description, functional capabilities and information flows*

ISO/IEC 11572:2000, *Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Circuit mode bearer services — Inter-exchange signalling procedures and protocol*

ISO/IEC 11571:1998, *Information technology — Telecommunications and information exchange between systems — Private Integrated Services Networks — Addressing*

ISO/IEC 15056:1997, *Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Inter-exchange signalling protocol — Transit counter additional network feature*

ISO/IEC 6523-1:1998, *Information technology — Structure for the identification of organizations and organization parts — Part 1: Identification of organization identification schemes*

ISO/IEC 6523-2:1998, *Information technology — Structure for the identification of organizations and organization parts — Part 2: Registration of organization identification schemes*

ITU-T Rec. I.112:1993, *Vocabulary of terms for ISDNs*

ITU-T Rec. I.210:1993, *Principles of telecommunication services supported by an ISDN and the means to describe them*

ITU-T Rec. Q.932:1998, *Digital subscriber signalling system No. 1 — Generic procedures for the control of ISDN supplementary services*

ITU-T Rec. X.217:1995 | ISO/IEC 8649:1996, *Information technology — Open Systems Interconnection — Service definition for the Association Control Service Element*

ITU-T Rec. X.227:1995 | ISO/IEC 8650-1:1996, *Information technology — Open Systems Interconnection — Connection-oriented protocol for the Association Control Service Element: Protocol specification*

ITU-T Rec. X.680:1997 | ISO/IEC 8824-1:1998, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation*

ITU-T Rec. X.681:1997 | ISO/IEC 8824-2:1998, *Information technology — Abstract Syntax Notation One (ASN.1): Information object specification*

ITU-T Rec. X.682:1997 | ISO/IEC 8824-3:1998, *Information technology — Abstract Syntax Notation One (ASN.1): Constraint specification*

ITU-T Rec. X.683:1997 | ISO/IEC 8824-4:1998, *Information technology — Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications*

ITU-T Rec. X.690:1997 | ISO/IEC 8825-1:1998, *Information technology — ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

ITU-T Rec. X.880:1994 | ISO/IEC 13712-1:1995, *Information technology — Remote Operations: Concepts, model and notation*

ITU-T Rec. X.881:1994 | ISO/IEC 13712-2:1995, *Information technology — Remote Operations: OSI realizations — Remote Operations Service Element (ROSE) service definition*

ITU-T Rec. X.882:1994 | ISO/IEC 13712-3:1995, *Information technology — Remote Operations: OSI realizations — Remote Operations Service Element (ROSE) protocol specification*

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 (ITU-T Rec. X.680)

– Private Integrated services Network eXchange (PINX) (ISO/IEC 11579-1)

– Private Integrated Services Network (ISO/IEC 11579-1)

– Service (ITU-T Rec. I.112)

– Signalling (ITU-T 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.

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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 PINX address

A PISN number as defined in ISO/IEC 11571 that is a complete number and that unambiguously identifies the addressed PINX or an addressable entity associated with that PINX.

4.31 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.

4.32 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 11579-1).

4.33 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.

4.34 ROSE APDU

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

4.35 Side

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

4.36 Signalling Carriage Mechanism (SCM)

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

4.37 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.

4.38 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.

4.39 Supplementary service

Section 2.4 of ITU-T Recommendation I.210 shall apply.

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

4.40 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.

4.41 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.

4.42 Terminal, Terminal Equipment

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

4.43 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.

4.44 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
PINX	Private Integrated services Network eXchange
PISN	Private Integrated Services Network
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.
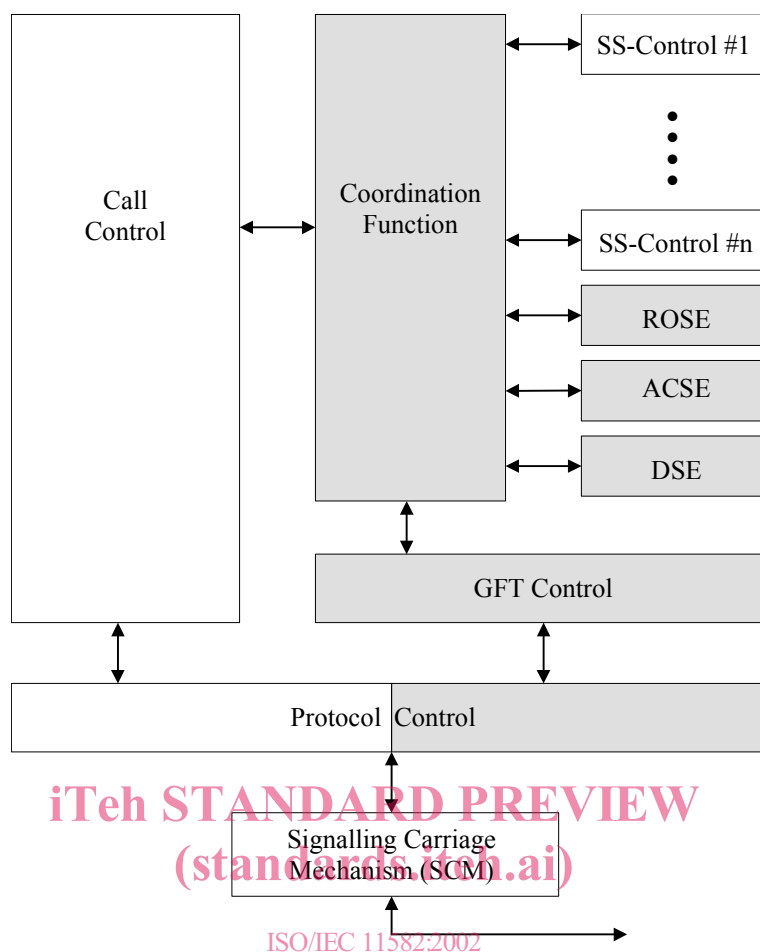
NOTE - The capabilities defined in this International Standard are indicated by shading, i.e. GFT-Control, DSE, ACSE, ROSE and extensions to Protocol Control. Part of the functions of the Coordination Function are also defined in this International Standard, but the remainder of this element governs supplementary service specific interactions which are beyond the scope of this International Standard.

Figure 1 — PSS1 Protocol Model

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 Functional 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 ITU-T Rec. X.881.

The Association Control Service Element (ACSE) is defined in ITU-T 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 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.