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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Mapping functions for the tunnelling of QSIG through IP networks

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Tracé de fonctions pour le «tunnelling» de QSIG par des réseaux IP

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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 2.

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 document 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 21992 was prepared by ECMA (as ECMA-336) 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.

Introduction

This International Standard is one of a series of standards defining mapping functions in exchanges of Private Integrated Services Networks required for the utilization of intervening network scenarios. The series uses the ISDN concepts as developed by ITU-T (formerly CCITT) and is also within the framework of standards for open systems interconnection as defined by ISO/IEC.

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 — Mapping functions for the tunnelling of QSIG through IP networks

1 Scope

This International Standard specifies functions for using a packet network that uses the Internet Protocol (IP) as its network layer protocol and UDP and TCP as its transport layer protocols, to interconnect two Private Integrated services Network eXchanges (PINXs) forming part of a Private Integrated Services Network (PISN). Interconnection is achieved by carrying the inter-PINX signalling protocol directly over the Transmission Control Protocol (TCP) and inter-PINX user information (e.g., voice) over the Real-time Transport Protocol (RTP), RTP being carried over the User Datagram Protocol (UDP). The inter-PINX signalling protocol is assumed to be QSIG, as specified in ISO/IEC 11572, ISO/IEC 11582 and other International Standards.

This International Standard provides for two types of interconnection:

— on-demand, where a separate TCP connection for QSIG is established at the start of each call and cleared down at the end of that call; and

— semi-permanent, where a single TCP connection with an indefinite lifetime carries QSIG on behalf of many single calls.

This International Standard is applicable to PINXs that can be interconnected to form a PISN using QSIG as the inter-PINX signalling protocol.

2 Conformance

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

3 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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 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 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 11582:2002, *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*

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*

IETF RFC 760, *Internet Protocol*

IETF RFC 761, *Transmission Control Protocol*

IETF RFC 768, *User Datagram Protocol*

IETF RFC 1889, *RTP: A Transport Protocol for Real-Time Applications*

IETF RFC 2126, *ISO Transport Service on top of TCP (ITOT)*

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1 External definitions

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

— IVN (ISO/IEC 11579-1)

— PINX (ISO/IEC 11579-1)

— PISN (ISO/IEC 11579-1)

— Service (ITU-T Rec. I.112)

— Signalling (ITU-T Rec. I.112)

4.2 Other definitions

4.2.1
Calling PINX
In the context of a call or call-independent signalling connection across an IPL, the PINX that transmits the QSIG SETUP message.

4.2.2
Called PINX
In the context of a call or call-independent signalling connection across an IPL, the PINX that receives the QSIG SETUP message.

4.2.3
Channel
A means of bi-directional transmission of user or signalling information between two points.

4.2.3.1
D_Q-Channel
A channel used to convey call control information between the Q reference points of two peer PINXs.

4.2.3.2
U_Q-Channel
A channel used to convey user information between the Q reference points of two peer PINXs.

4.2.4
Resource Control Information
Information exchanged between peer PINXs for the purpose of establishing UDP streams.

4.2.5
Inter-PINX Connection (IPC)
A connection provided by an IVN between two C reference points used to transport inter-PINX information from the PISN control plane and/or the PISN user plane.

4.2.6
QPKT
A packet format defined within this International Standard for conveying QSIG message and RCI (Resource Control Information).

5 List of acronyms

IP	Internet Protocol
IPC	Inter-PINX connection
IPL	Inter-PINX Link
IVN	InterVening Network
PINX	Private Integrated services Network eXchange
PISN	Private Integrated Services Network
QSIG	Signalling information flows at the Q reference point
RCI	Resource Control Information
RTCP	Realtime Transport Control Protocol
RTP	Realtime Transport Protocol
TCP	Transmission Control Protocol
UDP	User Datagram Protocol

6 Introduction

6.1 Reference configuration

ISO/IEC 11579-1 defines a reference configuration for a PINX. Logically the switching and call control functions of a PINX communicate over an instance of the Q reference point with a peer PINX. This communication is known as an Inter-PINX Link (IPL) and comprises a signalling channel, known as a D_Q-channel, and one or more user information channels, each known as a U_Q-channel; see Figure 1. One or more IPLs can be established between the same pair of PINXs.

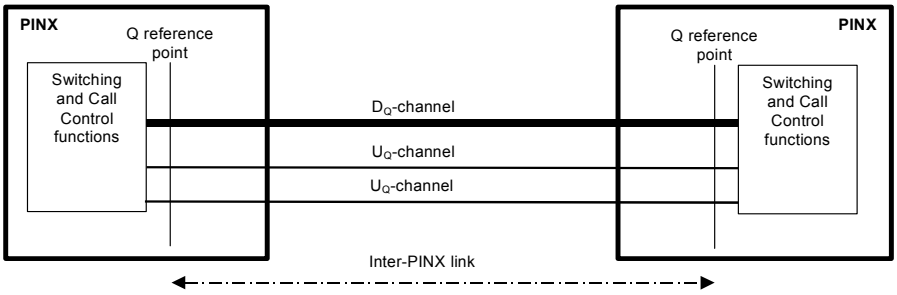

Figure 1 — IPL concept

There are many ways of implementing an IPL. In general, the IPL uses services of another network, known as an Intervening Network (IVN). A PINX interfaces to the IVN at the C reference point. The IVN provides

connections, known as Inter-PINX Connections (IPCs) between the C reference points of the peer PINXs. Mapping functions within each PINX map the D_Q-channel and the U_Q-channels at the Q reference point onto one or more IPCs at the C reference point.

6.2 Specific scenarios

This International Standard specifies mapping functions for use when the IVN is an IP-based network that is used to provide the following types of IPC:

— a TCP connection for carrying signalling information and Resource Control Information; and

— a pair of UDP streams, one stream in each direction, for carrying user information over RTP.

A single IPL requires a single TCP connection, for support of the D_Q-channel, and one pair of UDP streams per U_Q-channel. In addition to carrying the QSIG protocol, the TCP connection is also required to carry resource control information for establishing the UDP streams.

This International Standard supports two types of interconnection between peer PINXs:

— On-demand, where a single TCP connection for QSIG and a pair of UDP streams for user information are established at the start of each call and cleared down at the end of that call;

— Semi-permanent, where a single TCP connection with an indefinite lifetime carries QSIG on behalf of many calls.

In the semi-permanent case, the TCP connection can support zero, one or more than one call at the same time. A pair of UDP streams for user information is established at the start of each call and cleared down at the end of that call. Figure 2 illustrates these concepts.

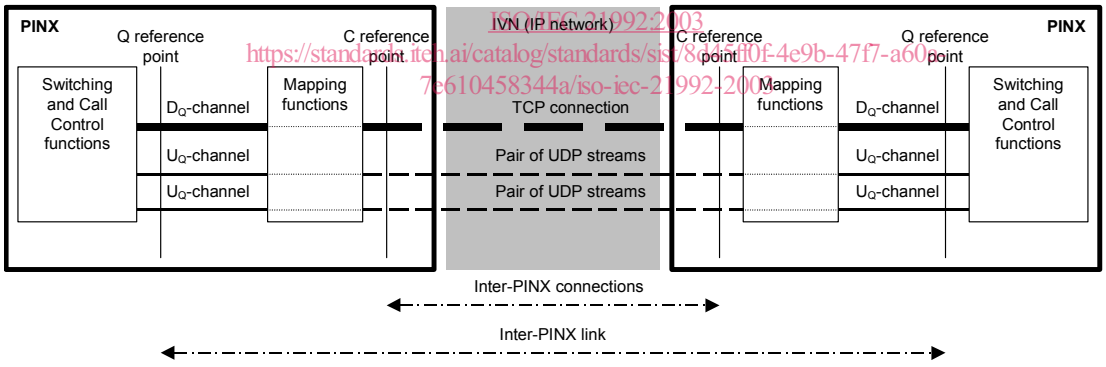

Figure 2 — IPC concept (Semi-permanent)

7 Capabilities at the Q reference point

For each instance of the Q reference point:

— one signalling channel (D_Q) for carrying the inter-PINX Layer 3 signalling protocol, and

— zero, one or more user channels (U_Q)

shall be provided.

NOTE In the special case of an on-demand interconnection used only for a call independent signalling connection, no U_Q-channels are provided.

For a U_Q-channel the following bearer capability shall be provided:

— transfer mode: circuit mode;

— information transfer rate: 64 kbit/s;

— information transfer capability: speech or 3,1 kHz audio;

— user information layer 1 protocol: G.711 A or μ law.

Other bearer capabilities are outside the scope of this International Standard.

For a D_Q-channel the following bearer capability shall be provided:

— transfer mode: packet mode;

— information transfer rate: implementation-dependent;

— information transfer capability: unrestricted digital information.

The functions to map D_Q- and U_Q-channels to an inter-PINX connection (IPC) at the C reference point are described in Clause 9.

8 Capabilities at the C reference point

The PINX mapping functions shall meet the following requirements.

8.1 TCP connection

A PINX shall support a packet network interface suitable for communication according to IETF RFC 761. The protocol stack used in this International Standard is described as Figure 3 below.

QSIG	RCI
QPKT	
TPKT	
TCP	
IP	

Figure 3 — Protocol stack for Mapping/IP-QSIG

The RCI provides information required to establish the media path(s).

A TPKT is a packet format as defined in IETF RFC 2126. It is used to delimit individual messages (PDUs) within the TCP stream, which itself provides a continuous stream of octets without explicit boundaries. A TPKT consists of a one octet version number field, followed by a one octet reserved field, followed by a two octet length field, followed by the actual data. The version number field shall contain the value “3”, the reserved field shall contain the value “0”. The length field shall contain the length of the entire packet including the version number, the reserved and the length fields as a 16-bit big-endian word.

A QPKT is a packet format as defined in Figure 4 below. A QPKT consists of a two octet length field, followed by a single QSIG message, followed by RCI. The first octet of the QSIG message shall be the octet immediately following the QPKT length field, the last octet shall be the octet immediately preceding the RCI. The length field indicates the length of the QSIG message and therefore indicates the start of the RCI.

len.	QSIG message	RCI

Figure 4 — QPKT structure of Mapping/IP-QSIG

NOTE In most circumstances, the RCI field is omitted.