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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Functional requirements for static circuit-mode inter-PINX connections

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Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Exigences fonctionnelles pour les connexions inter-PINX en mode circuit statique

Reference number

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

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Functional requirements for static circuit-mode inter-PINX connections

1. Scope

This International Standard is a part of the functional requirements for the Private Integrated Services Network (PISN) and defines the functions and procedures that are required by Private Integrated Services Network exchanges (PINXs) and the intervening network (IVN) in order to establish Inter-PINX Connections (IPC). The IPC is used for the transfer of signalling and user information between PINXs.

The Private Signalling System No.1 (PSS1) as defined in ISO/IEC 11572 and 11574 defines the signalling procedures and protocol for call control between PINXs at the Q reference point. These procedures are independent of the types of IVNs, called scenarios used to interconnect the PINXs. ISO/IEC TR14475 describes the use of various types of IVNs which provide the interconnections of PINXs.

In order to connect a PINX to another PINX, mapping functions are required to adapt the specific interfaces at the C reference point to the application at the Q reference point. As such, mapping functions provide for physical adaptation to the interface at the C reference point. Mapping functions also provide for the mapping of user channels and signalling information at the Q reference point to the appropriate channels or time-slots at the C reference point. The C and Q reference points are defined in ISO/IEC 11579-1.

The types of interfaces at the C reference point covered by this International Standard are:

[1]   1544 kbit/s unstructured digital leased line

[2]   1544 kbit/s structured digital leased line

[3]   2048 kbit/s unstructured digital leased line

[4]   2048 kbit/s structured digital leased line

[5]   64 kbit/s unrestricted digital leased line

[6]   1544 kbit/s ISDN Primary Rate user-network layer 1 interface

[7]   2048 kbit/s ISDN Primary Rate user-network layer 1 interface

[8]   ISDN Basic Rate user-network layer 1 interface

At the Q reference point the mappings provide a 64 kbit/s service for user channels and a packet mode service for the signalling channel. The applied mapping is a static mapping, i.e. there is a fixed relationship between user and signalling channels at the Q reference point and the timeslots of the interface at the C reference point. Any changes are subject to administrative actions.

This International Standard specifies PINX mapping functions between the Q reference point and the C reference point for IVNs which provide either dedicated or semi-permanent, non-user activation, circuit-mode IPCs. The dedicated IPC is the connection permanently established, usually for the duration of a contractual period. The semi-permanent IPC is the connection whose resources are reserved for specified times during a contractual period. The semi-permanent IPC is established by management control with or without user activations. In this International Standard, the semi-permanent IPC established by management control with user activation is outside the scope.

The IVN can be a dedicated physical link, dedicated transmission system or a cross connect system, or semi-permanent connection system. IVNs which include inverse mulitlexer techniques (e.g. channel aggregation in accordance with ISO/IEC 13871) are covered by this International Standard so far as they support one of the interfaces listed above.

This International Standard also specifies mapping information. At both sides of the PINX, mapping information is required to administer the scenarios.

This International Standard is applicable to PINXs which can be interconnected to form a Private Integrated Services Network (PISN) and which support signalling protocols at the Q reference point.

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.

[1]   ISO/IEC 11579-1:1994, *Information technology — Telecommunications and information exchange between systems — Private integrated services network — Part1: Reference configuration for PISN Exchanges (PINX)*.

[2]   ISO/IEC TR 14475:1996, *Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Architecture and Scenarios for Private Integrated Services Networking*.

[3]   ISO/IEC 11572:1997, *Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Circuit mode bearer services — Inter-exchange signalling procedures and protocol*.

[4]   ISO/IEC 11574:1994, *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*.

[5]   ITU-T Rec.G.703 (1991), *Physical/electrical characteristics of hierarchical digital interface*.

[6]   ITU-T Rec.G.704 (1995), *Synchronous frame structures used at primary and secondary hierarchical levels*.

[7]   ITU-T Rec.G.706 (1991), *Frame alignment and cyclic redundancy check (CRC) procedures relating to basic frame structures defined in Recommendation G.704*.

[8]   ITU-T Rec.I.431 (1993), *Primary rate user-network interface — Layer 1 specification*.

[9]   ITU-T Rec.I.430 (1995), *Basic rate user-network interface — Layer 1 specification*.

[10] ITU-T Rec.I.412 (1988), *ISDN user-network interfaces — Interface structures and access capabilities*.

[11] ITU-T Rec.I.140 (1993), *Attribute Technique for the characterization of Telecommunication Services supported by an ISDN and Network Capabilities of an ISDN*.

[12] ITU-T Rec.I.210 (1993), *Principles of Telecommunication Services Supported by and ISDN and the Means to describe them*.

[13] ITU-T Rec.Q.921 (1993), *ISDN User-Network Interface — Layer 2 specification*.

[14] ISO/IEC 2382-36:—[1), *Information technology — Vocabulary — Part 36: Private Integrated Services Network*.

[15] ISO/IEC 13871:1995, *Information technology — Telecommunications and information exchange between systems — Private telecommunications networks — Digital channel aggregation*.

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1) To be published.

4. Definitions

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

4.1 External definitions

-	PISN (Private Integrated Services Network)	[14]
-	PINX (Private Integrated Services Network Exchange)	[14]
-	IVN (Intervening Network)	[14]
-	SW (Switching Functional grouping)	[1]
-	MP (Mapping Functional grouping)	[1]
-	Q Reference Point	[1]
-	C Reference Point	[1]
-	IPC (Inter-PINX Connection)	[14]
-	IPL (Inter-PINX Link)	[14]

4.2 Specific Definitions

4.2.1 Channel

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

4.2.1.1 Dq channel

A channel used to convey signalling information including call control information between the Q reference points of two peer PINXs.

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4.2.1.2 Uq channel

A channel used to convey user information between the Q reference points of two PINXs.

4.2.2 Signalling Functions

4.2.2.1 QSIG (Signalling information flow at the Q reference point)

The generic term describing the signalling information flows (i.e. not a specific signalling protocol), within a Dq channel.

4.2.2.2 CSIG (Signalling information flow at the C reference point)

The generic term describing access signalling information flows (i.e. not a specific signalling protocol), between a PINX and an IVN, at the C reference point.

4.3 Symbols and Abbreviations

-	B	Timeslot providing of 64 kbit/s bearer capability
-	C C	Reference Point
-	Dq	Dq channel
-	IPC	Inter-PINX Connection
-	IVN	Intervening Network
-	MP	Mapping Functional grouping
-	PINX	Private Integrated Services Network Exchange
-	Q Q	Reference Point
-	QAB	Indicates a Q reference point that is associated with the interconnection between PINX A and B
-	QAC	Indicates a Q reference point that is associated with the interconnection between PINX A and C.
-	SW	Switching Functional grouping
-	Uq	Uq channel

5. Introduction

For the concept of mapping function reference is made to ISO/IEC TR 14475[2].

5.1 Type of IVN

The IVNs supporting permanent circuit-mode IPCs are as follows:

☐ Dedicated Transmission System

☐ Semi Permanently established channels of circuit-mode network

5.1.1 Dedicated Transmission System

The IPC is provided by a transmission mechanism. The IPC is established by management, see Figure 5.1.
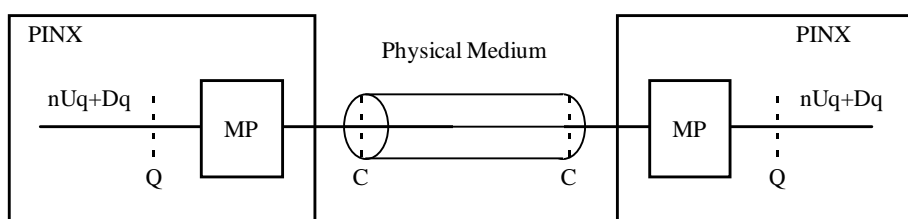

Figure 5.1 — Dedicated Physical medium

The transmission Medium can provide unstructured or channelized bitstream.

5.1.2 Semi-Permanent Connection

The dedicated or the semi-permanent IPCs are provided by a semi-permanent circuit-mode mechanism in the intervening network, in which the IPCs are permanently established by management control with or without user activation. The channels on an IPC (signalling and user information channels between associated two PINXs) at the Q reference point are mapped onto preassigned timeslots providing of 64 kbit/s bearer capability of the IVN access at the C reference point.

This scenario provides multiple IPCs leading to different PINXs.
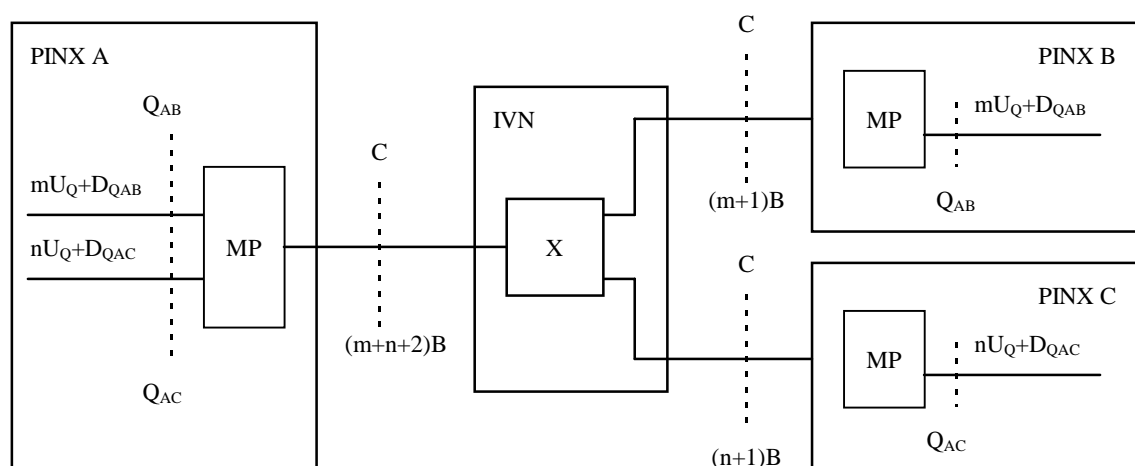
Figure 5.2 — Semi-permanent Connection

5.2 IVN Interface types

The Table 1 shows the categorization of the scenario type of permanent circuit-mode inter-PINX connections. It categorizes the IVN types in terms of the characteristics of the digital leased line for the provision of IPC. IVN interface types are only standardized in certain regions. The international availability of the full bit stream is outside the scope of this International Standard.

Table 5.1 — IVN Interface Types

	IVN Interface Types	Structurization	Note
1	Unstructured 1544 kbit/s digital leased line	-	
2	Structured 1544 kbit/s digital leased line	1536 kbit/s timeslots	Note 1
3	Structured 1544 kbit/s digital leased line	24 x 64 kbit/s timeslots	Note 3
4	Unstructured 2048 kbit/s digital leased line	1984 kbit/s timeslots	
5	Structured 2048 kbit/s digital leased line	1984 kbit/s timeslots	Note 2
6	Structured 2048 kbit/s digital leased line	31 x 64 kbit/s timeslots	Note 3
7	64 kbit/s digital leased line	64 kbit/s timeslot	
8	ISDN1544kbit/s Primary Rate Interface	According to ITU-T Rec.I.431	
9	ISDN 2048kbit/s Primary Rate Interface	According to ITU-T Rec.I.431	
10	ISDN Basic Rate Interface	According to ITU-T Rec.I.430	

Note 1:

This type of leased line that is used to interconnect PINXs is a digital transmission link providing primary rate (1544 kbit/s) capability. In this mapping type, the derived channel at the Q reference point shall be mapped onto the time slot the information transfer rate of which is at 64 kbit/s without alteration between the PINXs.

Note 2:

In Europe and Australia it is possible to get 2048 kbit/s leased lines in two different ways. Alternative 1 is unstructured version, which provides unstructured bit stream at 2048 kbit/s (there is no channelisation). Alternative 2 is a channelized version in which time slot 0 is not necessarily transparent. Normally however the leased line offers the remaining 31 channels so that they can be used as 1984 kbit/s or as 31 x 64 kbit/s.

For the case of an unstructured leased line, it should be considered as one IPC at 2048 kbit/s. One possible mapping is to map it to 31 x 64 kbit/s channels. For the structured case especially when used with a cross connect the interface should be considered as providing 31 IPCs cash at 64 kbit/s.

Note 3:

It is a make of subscription, while all 64 kbit/s timeslots are though connected end-to-end. Timeslot sequence integrity is guranteed.

5.3   IPC Bearer Capabilities

IPC Bearer Capabilities depend on IVN Interface describing in the table below.

In each IVN types, the bearer capabilities shall be the assume in both PINXs for any given channel at the Q reference point. While, as a default solution, the bearer capabilities of any given channel at the Q reference point may be the same as provided by the IVN, the channels offered to the Q reference point can have deferent bearer capabilities provided by the IVN. The bearer modification function allows for conditioning the bearer capabilities provided by the IVN, depending on the bearer capabilities desired at the Q reference point. This bearer modification function is outside the scope of this International Standard.

Table 5.2 — IPC Bearer Capabilities (Structured 1544 kbit/s)

	Attribute	Attribute Values	Note
1	IPC Information Transfer Mode	Circuit	
2	IPC Information Transfer Rate	-	
3	IPC Bearer Capability	Unrestricted digital information	
4	Establishment of Connection	Semi-Permanent Permanent	
5	Symmetry	Bi-directional symmetric	
6	Connection Configuration	Point-to-Point	
7	Structure	8 kHz integrity Time slot sequence integrity	Note 2
8	Channel Type	Not Applicable	
9	Connection Control Protocol Information Transfer Coding	Not Applicable	Note 1

Note 1:

While coding for speech and 3.1 kHz audio are given as a route attribute, it is the responsibility of PISN users to ensure that a compatible encoding scheme such as A/m low coding. PISN users should also recognize no network provision can be made for control of echo and loss.

Note 2:

There are cases the IVNs may use processing technique appropriate for speech such as analogue transmission, echo cancellation and low bit rate voice encoding, hence the bit integrity is not assured.

Table 5.3 — IPC Bearer Capabilities (Structured 1544 kbit/s, 1536 kbit/s timeslots)

	Attribute	Attribute Values	Note
1	IPC Information Transfer Mode	Circuit	
2	IPC Information Transfer Rate	1536 kbit/s	
3	IPC Bearer Capability	Unrestricted digital information	
4	Establishment of Connection	Semi-Permanent Permanent	
5	Symmetry	Bi-directional symmetric	
6	Connection Configuration	Point-to-Point	
7	Structure	8 kHz integrity Time slot sequence integrity	Note 2
8	Channel Type	Not Applicable	
9	Connection Control Protocol Information Transfer Coding	Not Applicable	Note 1

Note 1:

While coding for speech and 3.1 kHz audio are given as a route attribute, it is the responsibility of PISN users to ensure that a compatible encoding scheme such as A/m low coding. PISN users should also recognize no network provision can be made for control of echo and loss.

Note 2:

There are cases the IVNs may use processing technique appropriate for speech such as analogue transmission, echo cancellation and low bit rate voice encoding, hence the bit integrity is not assured.

Table 5.4 — IPC Bearer Capabilities (Structured 1544 kbit/s, 24 x 64 kbit/s channels)

	Attribute	Attribute Values	Note
1	IPC Information Transfer Mode	Circuit	
2	IPC Information Transfer Rate	1536 kbit/s	
3	IPC Bearer Capability	Unrestricted digital information	
4	Establishment of Connection	Semi-Permanent Permanent	
5	Symmetry	Bi-directional symmetric	
6	Connection Configuration	Point-to-Point	
7	Structure	8 kHz integrity Time slot sequence integrity	
8	Channel Type	Not Applicable	
9	Connection Control Protocol Information Transfer Coding	Not Applicable	

Table 5.5 — IPC Bearer Capabilities (Unstructured 2048 kbit/s, 1984 kbit/s timeslots)

	Attribute	Attribute Values	Note
1	IPC Information Transfer Mode	Circuit	
2	IPC Information Transfer Rate	1984 kbit/s	
3	IPC Bearer Capability	Unrestricted digital information	
4	Establishment of Connection	Semi-Permanent Permanent	
5	Symmetry	Bi-directional symmetric	
6	Connection Configuration	Point-to-Point	
7	Structure	8 kHz integrity Time slot sequence integrity	
8	Channel Type	Not Applicable	
9	Connection Control Protocol Information Transfer Coding	Not Applicable	

Table 5.6 — IPC Bearer Capabilities (Structured 2048 kbit/s, 1984 kbit/s timeslots)

	Attribute	Attribute Values	Note
1	IPC Information Transfer Mode	Circuit	
2	IPC Information Transfer Rate	1984 kbit/s	
3	IPC Bearer Capability	Unrestricted digital information	
4	Establishment of Connection	Semi-Permanent Permanent	
5	Symmetry	Bi-directional symmetric	
6	Connection Configuration	Point-to-Point	
7	Structure	8 kHz integrity Time slot sequence integrity	
8	Channel Type	Not Applicable	
9	Connection Control Protocol Information Transfer Coding	Not Applicable	

Table 5.7 — IPC Bearer Capabilities (Structured 2048 kbit/s, 31 x 64 kbit/s timeslots)

	Attribute	Attribute Values	Note
1	IPC Information Transfer Mode	Circuit	
2	IPC Information Transfer Rate	N x 64 kbit/s	
3	IPC Bearer Capability	Unrestricted digital information	
4	Establishment of Connection	Semi-Permanent Permanent	
5	Symmetry	Bi-directional symmetric	
6	Connection Configuration	Point-to-Point Point-to-Multipoint	
7	Structure	8 kHz integrity Time slot sequence integrity	
8	Channel Type	Not Applicable	
9	Connection Control Protocol Information Transfer Coding	Not Applicable	

Table 5.8 — IPC Bearer Capabilities (64 kbit/s, 64 kbit/s timeslot)

	Attribute	Attribute Values	Note
1	IPC Information Transfer Mode	Circuit	
2	IPC Information Transfer Rate	64 kbit/s	
3	IPC Bearer Capability	Unrestricted digital information	
4	Establishment of Connection	Semi-Permanent Permanent	
5	Symmetry	Bi-directional symmetric	
6	Connection Configuration	Point-to-Point	
7	Structure	8 kHz integrity Time slot sequence integrity	
8	Channel Type	Not Applicable	
9	Connection Control Protocol Information Transfer Coding	Not Applicable	

Table 5.9 — IPC Bearer Capabilities (ISDN 1544 kbit/s Primary Rate User-Network Layer 1 Interface)

	Attribute	Attribute Values	Note
1	IPC Information Transfer Mode	Circuit	
2	IPC Information Transfer Rate	64 kbit/s	up to 24 IPCs
3	IPC Bearer Capability	Unrestricted digital information	e.g. unrestricted digital speech
4	Establishment of Connection	Semi-Permanent Permanent	
5	Symmetry	Bi-directional symmetric	
6	Connection Configuration	Point-to-Point	
7	Structure	8 kHz integrity Time slot sequence integrity	
8	Channel Type	Not Applicable	
9	Connection Control Protocol Information Transfer Coding	Not Applicable	