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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Architecture and scenarios for Private Integrated Services Networking

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseau privé à intégration de services — Architecture et scénarios pour réseau privé à intégration de services

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Foreword

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In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The main task of technical committees is to prepare International Standards, but in exceptional circumstances a technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

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

Attention is drawn to the possibility that some of the elements of this Technical Report 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 TR 14475, which is a Technical Report of type 3, was prepared   by Joint Technical Committee ISO/IEC JTC 1, *Information technology,* Subcommitee SC 6, *Telecommunications and information exchange between systems*.

This second edition cancels and replaces the first edition (ISO/IEC TR 14475:1996), which has been technically revised.

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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Architecture and scenarios for Private Integrated Services Networking

1 Scope

A Private Integrated Service Network (PISN) is a network comprising either one PINX or more than one PINX interconnected by Inter-PINX connections. This Technical Report is concerned with inter-PINX connections (IPC) that are provided by Intervening Networks (IVN), and the way in which these are handled by PINXs to provide a platform for inter-PINX communication. Different types of IVNs can be used to provide IPCs, in accordance with the scenarios indicated in ISO/IEC 11579-1. These are Overlay Scenarios in that they enable the services of the PISN to operate transparently across an IVN.

Connected PINXs need to co-ordinate their use of IVNs, and appropriate standardisation is needed to allow networks to be created employing PINXs and IVNs from multiple vendors. The following points need to be considered:

— In general but depending on the type of IVN, procedures and signalling protocols between the PINXs are needed for the establishment, maintenance and release of IPCs. Appropriate standardisation of these procedures and signalling protocols is necessary.

— At the Q reference point (a conceptual point within a PINX) channels and PISN call control signalling (QSIG) are defined independently of the type of IVN. However, at the C reference point (where the PINX is connected to the IVN), the representation of the channels and of signalling is dependent on the type of IVN, and on how the PINXs use the IPCs. Appropriate standardisation of these aspects at the C reference point is necessary.

— In general the relationship between a channel at the Q reference point and its representation at the C reference point is not static, and procedures and signalling between the PINXs are needed for the co-ordination of these relationships. Appropriate standardisation of these procedures and signalling is necessary.

— Appropriate mechanisms need to be standardised for conveying inter-PINX signalling through the IVN. These will depend on the characteristics of the IPC used.

The aim of this Technical Report is to identify:

1. In addition to PISN call control signalling (QSIG), what needs to be standardised, in order to be able to inter-connect PINXs;

2. General techniques, procedures, protocols etc., that apply to of all (or at least very many) types of IVNs.

2 References

ISO/IEC 7776:1995, *Information technology — Telecommunications and information exchange between systems — High-level data link control procedures — Description of the X.25 LAPB-compatible DTE data link procedures*

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 11582:1995, *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.140 (1993), *Attribute technique for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN*

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

ITU-T Rec. I.130 (1988), *Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN*

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

ITU-T Rec. I.411 (1993), *ISDN user-network interfaces — Reference configurations*

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

ITU-T Rec. X.31 (1995), *Support of packet mode terminal equipment by an ISDN*

3 Terms and definitions

For the purposes of this Technical Report the following terms and definitions apply.

3.1 External Definitions

This Technical Report uses the following terms defined in other documents:

— Basic Service	(ITU-T Rec. I.210)
— Private Integrated Services Network (PISN)	(ISO/IEC 11579-1)
— Private Integrated Services Network Exchange (PINX)	(ISO/IEC 11579-1)
— Service	(ITU-T Rec. I.112)
— Signalling	(ITU-T Rec. I.112)
— Supplementary Service	(ITU-T Rec. I.210)
— Supplementary Service Control Entity	(ISO/IEC 11582)
— Terminating PINX	(ISO/IEC 11572)
— Transit PINX	(ISO/IEC 11572)
— User	(ISO/IEC 11574)

3.2 Special Definitions

Attached PINX: A PINX that is attached to a VPN and capable of using VPN services.

NOTE –   In the context of a call, the attached PINX can be an end-PINX (i.e. serving the originating or destination user or acting as a gateway with another network) or it can be a transit-PINX.

Centrex: That part of a VPN that emulates an End-PINX.

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

D_C-**Channel**: A channel used to convey IPC control information, at the C reference point, between a PINX and an IVN.

NOTE - This does not preclude the conveyance of other types of information.

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

NOTE - Call control information can include information for the control of basic services, supplementary services, additional network features, etc.

IPL-Service-Channel (IS-Channel): A channel used to convey information related to the management of scenarios between the two peer PINXs.

NOTE - This channel conveys ScenSIG. The use for other applications is outside the scope of this Technical Report.

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

Corporate Telecommunication Network (CN): A **CN** consists of a set of equipment (Customer Premises Equipment and/or Customer Premises Network) that are located at geographically dispersed locations and are interconnected to provide networking services to a defined group of users.

NOTE - The ownership of the equipment is not relevant to this definition.

NOTE - In this Technical Report, even equipment that is not geographically dispersed (e.g., a single PBX or a Centrex providing service to users at a single location) may form a CN.

Interconnecting Network (ICN): The emulation of transit-PINX functionality by equipment that is physically part of the public network infrastructure. In addition, it includes one or more IVNs and may include the emulation of gateway-PINX functionality.

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.

Inter-PINX Link (IPL): A link between the Q reference points of two PINXs, comprising the totality of signalling transfer and user information transfer means.

Relay Node (functionality): Within the context of a call the functionality that distinguishes calls between users in the Corporate Network, and relays such calls to designated PINX functionality emulated by public network equipment, or to an attached PINX. This may be via other relay nodes.

NOTE - Relay Node functionality includes transparent handling of private networking information (e.g. transit counter).

Signalling Functions

CSIG: 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.

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

TSIG: The generic term describing signalling information flows (i.e. not a specific signalling protocol) for interworking between a PINX and the public ISDN (which occurs at the T reference point).

ScenSIG: The generic term describing the signalling information flows (i.e. not a specific signalling protocol) that support the handling of the specific scenario employed between the two interconnected PINXs.

Scenario: A particular type of IPC provided by a particular type of IVN.

Semi-permanent connection: A connection in a switched network established by the network operator.

Virtual Private Network (VPN): Is that part of a CN that provides corporate networking using shared switched resources from a third party provider (e.g. a public network).

4 Symbols and Abbreviations

ACP	Availability Check Procedure
C	C reference point
C_i	Instance i of a C reference point
Ch	Channel
CC	Call Control functional grouping
CLIP	Calling Line Identification Presentation
CM	Circuit Mode
COLP	Connected Line Identification Presentation
CSIG	SIGnalling information flows at the C reference point
CUG	Closed User Group
DDI	Direct Dial In
HLC	High Layer Compatibility
ICC	Inter-PINX Connection (IPC) Control functional grouping
Id	Identity
IFC	InterFaCe
IPC	Inter-PINX Connection
IPL	Inter-PINX Link
IS	IPL Service
IVN	InterVening Network
LLC	Low Layer Compatibility
MC	Mapping Control
MP	MaPping functional grouping
NP	Numbering Plan
PSPDN	Packet Switched Public Data Network
PISN	Private Integrated Service Network
PINX	Private Integrated Network EXchange
PM	Packet Mode
Q	Q reference point

Q$_i$	Instance i of a Q reference point
QSIG	SIGnalling information flows at the Q reference point
ScenSIG	Scenario SIGnalling information flows
SS #7	Signalling System No. 7
SW	SWitching functional grouping
T	T reference point
TSIG	SIGnalling information flows at the T reference point

5   Introduction

Some general mapping functions are listed in the reference configuration for PINXs, defined in ISO/IEC 11579-1. Further definitions are required to understand the co-operation of functions in a PINX, to derive from them a subset, which needs to be standardised.

Subclause 5.1 provides an excerpt from those functions mentioned in ISO/IEC 11579-1, which are relevant to this document. Subclause 5.2 and its subclauses describe refinements of these functions and some additions necessary for understanding the overall context.

5.1   PINX Reference Configuration

Figure 1 shows an excerpt from the PINX reference configuration as described in ISO/IEC 11579-1.
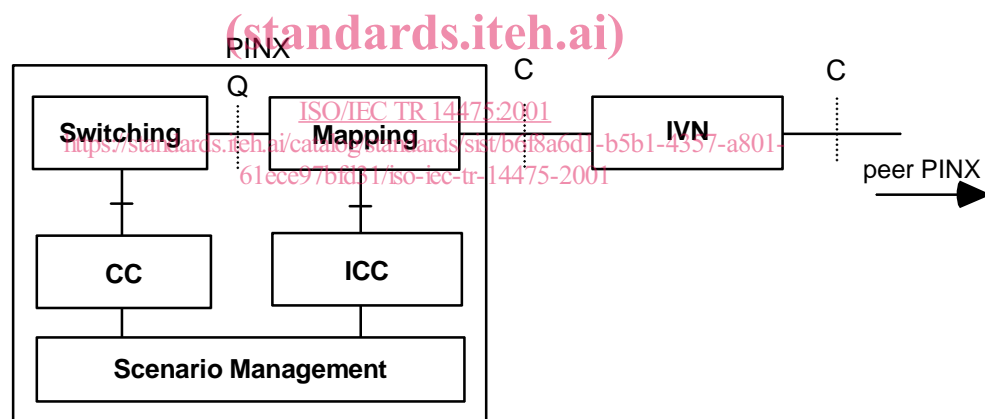
Figure 1 - PINX Reference Configuration (Excerpt)

Depending on the topology of a particular PISN, a PINX may in practice have links with several other PINXs and may also have more than one link with the same PINX, i.e. more than one inter-PINX link may be present on a particular PINX. A PINX will then have an instance of the Q reference point (Q_1 ... Q_n) for each IPL. This is not shown in Figure 1 (and also not in subsequent figures).

For the purpose of this Technical Report, the key aspects derived from ISO/IEC 11579-1 are:

— Mapping Functional Grouping (MP)
The MP provides the functions which are necessary to adapt to physical, electrical and procedural conditions of the interface between the PINX and the IVN. MP also provides the multiplexing functions which are required to separate or merge the information flows to or from SW from or to the user plane of the IVN, and between ICC and the control plane of the IVN.

— Switching Functional Grouping (SW)
The SW provides the switching functions for user and signalling information. Signalling information is switched between the CC and MP.

— Call Control Functional Grouping (CC)
The CC provides the functions which are necessary to control the call and the connection through a PISN.

— Inter-PINX Connection Control Functional Grouping (ICC)
This functional grouping provides the functions which are necessary to control the inter-PINX connection (IPC) through the intervening network.

— Scenario Management Functional Grouping
Scenario Management coordinates the provision and use of IPCs by:

— using the services of ICC to establish and release IPCs;

— using the services of ICC to liaise with the Scenario Management of the peer PINX to agree on the use of IPCs;

— instructing MP to map D_Q-channels and U_Q-channels onto IPCs and provide any required Bearer Conditioning.

5.2   Additional Descriptions

To apply a reference configuration to real implementations, distinction must be made between characteristics present at the C reference point and characteristics present at the Q reference point. To facilitate this, the following concepts are introduced:

— Inter-PINX connection (IPC); and

— Inter-PINX link (IPL).

5.2.1   Inter-PINX Connection (IPC)

An IPC is described by the attributes of the bearer service that the IVN provides. An example attribute list is given in Annex A.

At each end an IPC is terminated at an interface at the C reference point.

NOTE 1- Bearer services providing connections that span over more than one interface are not specifically discussed by this document.

An interface can terminate multiple IPCs. Different IPCs terminating on the same interface can lead to the same peer PINX or to other peer PINXs. The number of IPCs available at an interface depends on the IVN services that the IPC uses and on the type of interface.

The types of interfaces can be different at both sides of the IVN. The IVN functionality can be provided by multiple physical networks, of the same or of different types (e.g. ISDN at one side and PSTN at the other side).

A PINX can have more than one interface at the C reference point.

NOTE 2 - Besides supporting the functionality specified for the C reference point, an interface can be used for other functionality, e.g. as specified for the T reference point (shared access use). Such use is outside the scope of this Technical Report.

5.2.2   Inter-PINX Link (IPL)

An IPL can be established between the Q reference points of two peer PINXs. More than one IPL may be established between the same pair of PINXs. In this case each IPL appears, at each PINX, at a separate instance of the Q reference point.