TECHNICAL REPORT

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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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Contents

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.

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 Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC TR 14475, which is a Technical Report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 6, *Telecommunications and information exchange between systems*.

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 [1]. These are Overlay Scenarios in that they enable the services of the PISN to operate transparently across an IVN.

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

1. In general but depending on the type of IVN, procedures and signalling protocols between the PINXs are needed for the establishment, maintenance and disestablishment of IPCs. Appropriate standardization of these procedures and signalling protocols is necessary.
2. 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 standardization of these aspects at the C reference point is necessary.
3. 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 coordination of these relationships. Appropriate standardization of these procedures and signalling is necessary.
4. Appropriate mechanisms need to be standardized 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 standardized, in order to be able to inter-connect PINXs;
2. techniques, procedures, protocols etc. that are general in that they apply to the use of all (or at least very many) types of IVNs.

2 References

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

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.*

ITU-T Rec. I.140(1994), *Attribute technique for the characterization of telecommunication services supported by an ISDN and netwrok capabilities of an ISDN (Blue Book).*

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

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

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

3 Definitions

For the purposes of this Technical Report the following 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

3.2.1 Scenario

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

3.2.2 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.

3.2.3 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.

3.2.4 Channel

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

3.2.4.1 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.

3.2.4.2 U_Q-Channel

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

3.2.4.3 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.

3.2.4.4 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.

3.2.5 Signalling Functions

3.2.5.1 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.

3.2.5.2 QSIG

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

3.2.5.3 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).

3.2.5.4 ScenSIG

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

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 cooperation of functions in a PINX, to derive from them a subset which needs to be standardized.

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.

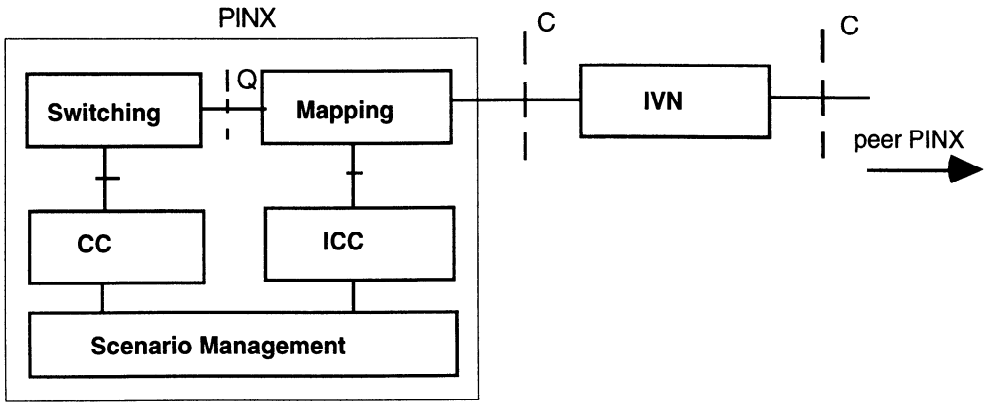

Figure 1 - PINX Reference Configuration (Excerpt)

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 [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 for 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 - Beside 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.

An IPL consists of one or more channels. One of the channels (D_Q-channel) must be capable of conveying PISN call control information flows (QSIG).

Further channels (U_Q-channels), can be included into, or removed from, an IPL as required to satisfy current or anticipated network traffic.

To fully describe a channel of an IPL, the following information is used:

- the IPL identity (i.e. the instance of Q reference point);
- the channel identity (number);
- channel usage (User information, QSIG);
- the channel characteristics.

The way that IPCs are provided by the IVN may have impact on the performance and reliability of the IPL, and on the ability of the IVN to indicate failures to the adjacent PINXs.

5.2.2.1 IPL Identity

The IPL identity corresponds to the instance of the Q reference point. The fact that such an instance can exist needs to be known to both PINXs prior to IPL establishment.

5.2.2.2 Channel Identity

The channel identity is expressed by a channel number that needs to be unique within the IPL.

5.2.2.3 Channel Usage

Channel usage indicates whether a given channel is used for user information transfer or for signalling purposes.

5.2.2.4 Channel Characteristics

The channel characteristics are expressed in terms of attributes, as described in Annex A.

NOTE - Channels of similar characteristics may be grouped, e.g. for routing purposes. This is outside the scope of this Technical Report.

5.2.3 Relationship between IPLs and IPCs

The IPL appears at the Q reference point in terms of channels, and each channel is carried by means of an IPC. An IPC can by further functions within the MP, e.g. the inclusion of multiplexing

and demultiplexing functions and/or splitting and merging functions, carry more or less than a channel of an IPL (see Mapping Matrix, 6.1.2).

6 Details of the Functional Groupings as Relevant for Scenario Handling

6.1 Mapping Unit (MP)

The MP (see Figure 2) conceptually contains two subfunctions:

- physical adaptation, and
- mapping matrix.

Some of the subfunctions may be NULL in a particular implementation.

Whereas Physical Adaptation contains interface-related functionality, with regard to the C reference point, the Mapping Matrix provides IPL-related functionality, with regard to the Q reference point.

Both functions are described below; they can contain further subfunctions.

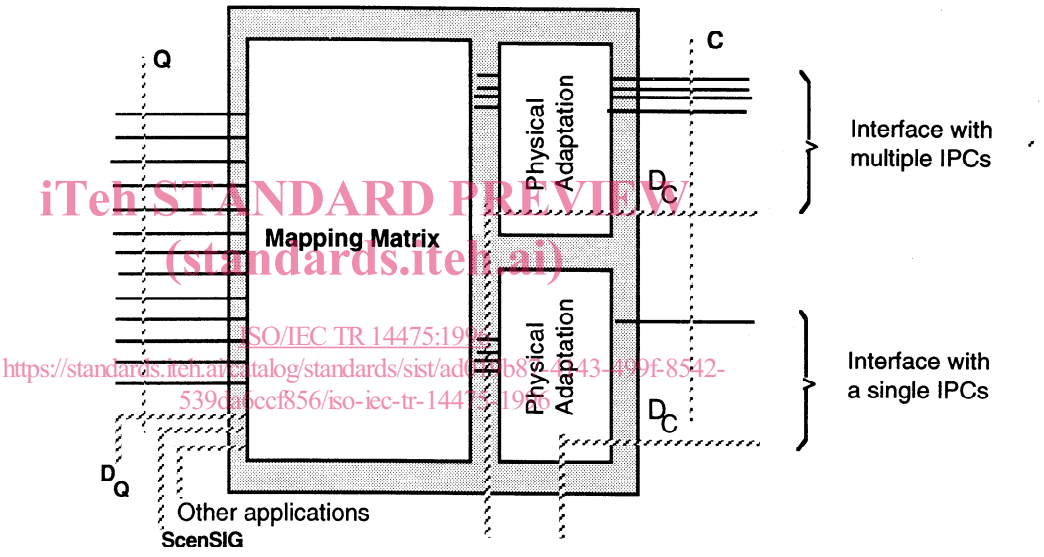

Figure 2 - Conceptual Infrastructure of the Mapping Functional Grouping

6.1.1 Physical Adaptation

The interface oriented Physical Adaptation function provides for the physical termination of the IVN interface. This includes handling of the IVN-inherent management functions, e.g. as specified for timeslot 0 of a primary rate interface, bit and frame synchronization, power feeding, etc.

If applicable, the D_C-channel is added to/extracted from the interface.

6.1.2 Mapping Matrix

This function provides for the mapping of channels at the Q reference point and of the IS-channel to the IPC(s) at the interface(s) at the C reference point (or the channels obtained by structurization, if applicable). This can include any multiplexing/demultiplexing functions and/or splitting/merging functions. The Mapping Matrix is under the control of the Mapping Management function, see 6.3.2.