

ECMA

Standardizing Information and Communication Systems

**PTNX Functions for the
Utilization of Intervening
Networks in the Provision of
Overlay Scenarios
(Transparent Approach)
- General Requirements**

(TR/Mapping)

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Brief History

This Technical Report ECMA TR/65 is one of a series of documents which are applicable to Private Telecommunication Networks (PTNs). Its purpose is to serve as a common reference for mapping functions of PTNXs when using intervening networks for their interconnections.

Technical Report ECMA TR/65 is based on the general Private Telecommunication Network concepts described in Technical Report ECMA TR/57 which is based on the ISDN concept as developed by the CCITT (and now the ITU-T) and refined by ETSI for European applications. In this regard it takes account of ENV 41006 and ETSI TCR-TR 010.

This Technical Report is based on the practical experience of ECMA member companies, and is a result of their active and continuous participation in the work of ISO/IEC JTC1, ITU-T, and various regional and national standardization bodies in Europe and North America. It represents a pragmatic and widely based consensus.

This ECMA Technical Report is offered for publication as an ETSI Technical Report.

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1 Scope

A Private Telecommunication Network (PTN) is a network comprising either one PTNX or more than one PTNX interconnected by inter-PTNX connections. This Technical Report is concerned with inter-PTNX connections (IPCs) that are provided by Intervening Networks (IVNs), and the way in which these are handled by PTNXs to provide a platform for inter-PTNX communication. Different types of IVNs can be used to provide IPCs, in accordance with the scenarios indicated in ENV 41006. These are transparent scenarios in that they enable the services of the PTN to operate transparently across an IVN.

Connected PTNXs need to coordinate their use of IVNs, and appropriate standardization is needed to allow networks to be created employing PTNXs 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 PTNXs are needed for the establishment, maintenance and dis-establishment of IPCs. Appropriate standardization of these procedures and signalling protocols is necessary.
2. At the Q-reference point (a conceptual point within a PTNX) channels and PTN call control signalling (QSIG) are defined independently of the type of IVN.

However, at the C-reference point (where the PTNX is connected to the IVN), the representation of the channels and of signalling is dependent on the type of IVN, and on how the PTNXs 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 PTNXs 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-PTNX signalling through the IVN. These will depend on the characteristics of the IPC used.

The aim of this Technical Report is to identify:

- i) in addition to PTN call control signalling (QSIG), what needs to be standardized, in order to be able to interconnect PTNXs;
- ii) 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

This Technical Report quotes, by dated or undated reference, provisions from other publications. These references are cited at appropriate places in the text.

ECMA-141	Private Telecommunication Networks (PTN) - Inter-Exchange Signalling - Data Link Layer Protocol (QSIG-L2) (1993)
ECMA TR/57	Private Telecommunication Networks (1991)
ENV 41006	Scenarios for Interconnections between Exchanges of Private Telecommunication Networks (1990)
ETS 300 125	ISDN - User-Network Interface - Layer 2 Basic and Primary Rate Specification (1991)
prETS 300 415	Private Telecommunication Networks; Terms and Definitions (1993)
ETSI TCR-TR 010	Provision of Connections for interconnecting Private Telecommunication Network Exchanges (PTNXs) (1993)
ISO/IEC 11579	Reference Configuration, Part 1 - Reference Configuration for PISN Exchanges (1994)
ISO 7776	Information Processing Systems - Data Communication - High-Level Data Link Control Procedures - Description of the X.25 LAPB-compatible DTE Data Link Procedures (1986)
CCITT Rec. I.112	Vocabulary of terms for ISDNs (1988)

CCITT Rec. I.140	Attribute technique for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN (1988)
CCITT Rec. I.411	ISDN user-network interface - reference configurations (1988)

3 Definitions

3.1 External definitions

The following external definitions apply:

- (PTN) user prETS 300 415
- PTN administrator prETS 300 415
- Q-reference point ISO/IEC 11579
- C-reference point ISO/IEC 11579

3.2 Special definitions

3.2.1 Scenario

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

3.2.2 Inter-PTNX connection (IPC)

A connection provided by an IVN between two C-reference points used to transport inter-PTNX information from the PTN control plane and/or the PTN user plane.

NOTE 1

This is a modification of the definition in prETS 300 415.

3.2.3 Inter-PTNX link (IPL)

A link between the Q-reference points of two PTNXs, 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.

NOTE 2

This is a modification of the definition in prETS 300 415.

3.2.4.1 D_Q-channel

A channel used to convey call control information between the Q-reference points of two peer PTNXs.

NOTE 3

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 PTNXs.

3.2.4.3 D_C-channel

A channel used to convey IPC control information, at the C-reference point, between a PTNX and an IVN.

NOTE 4

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 PTNXs.

NOTE 5

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 PTNX 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 PTNX and the public ISDN (which occurs at the T-reference point).

NOTE 6

The T-reference point is defined in CCITT Rec. I.411, figure 1/I.411.

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 PTNXs.

4 Symbols and abbreviations

ADPCM	Adaptive Delta Pulse Code Modulation
ATM	Asynchronous Transfer Mode
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-PTNX Connection (IPC) Control functional grouping
Id	Identity
IFC	InterFaCe
IPC	Inter-PTNX Connection
IPL	Inter-PTNX Link
IS	IPL Service
IVN	InterVening Network
LLC	Low Layer Compatibility
MP	MaPping functional grouping
NP	Numbering Plan
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephone Network
PTN	Private Telecommunication Network
PTNX	Private Telecommunication 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 PTNXs, defined in ISO/IEC 11579. Further definitions are required to understand the cooperation of functions in a PTNX, to derive from them a subset which needs to be standardized.

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

5.1 PTNX reference configuration

Figure 1 shows an excerpt from the PTNX reference configuration as described in ISO/IEC 11579.

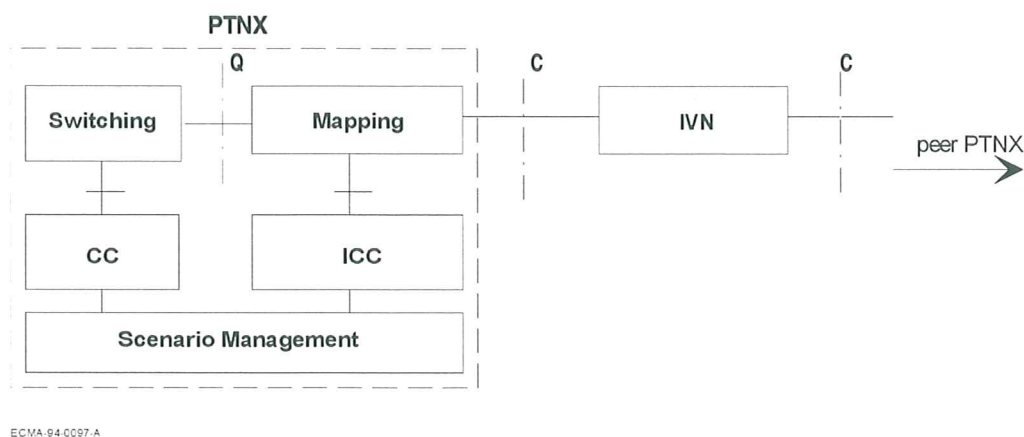


Figure 1 - PTNX reference configuration (excerpt)

Depending on the topology of a particular PTN, a PTNX may in practice have links with several other PTNXs and may also have more than one link with the same PTNX, i.e. more than one inter-PTNX link may be present on a particular PTNX. A PTNX will then have an instance of the Q-reference point ($Q_1 \dots Q_n$) 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 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 PTNX 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 PTN.
- Inter-PTNX Connection Control Functional Grouping (ICC)
This functional grouping provides the functions which are necessary to control the inter-PTNX 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 PTNX 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-PTNX link (IPL);
- Inter-PTNX connection (IPC).

5.2.1 Inter-PTNX 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 7

Bearer services providing for connections that span over more than one interface are not specifically discussed by this Technical Report.

An interface can terminate multiple IPCs. Different IPCs terminating on the same interface can lead to the same peer PTNX or to other peer PTNXs. 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 PTNX can have more than one interface at the C-reference point.

NOTE 8

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-PTNX link (IPL)

An IPL can be established between the Q-reference points of two peer PTNXs. More than one IPL may be established between the same pair of PTNXs. In this case each IPL appears, at each PTNX, 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 PTN 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 PTNXs.

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 PTNXs 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 9

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 de-multiplexing 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,
- 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.

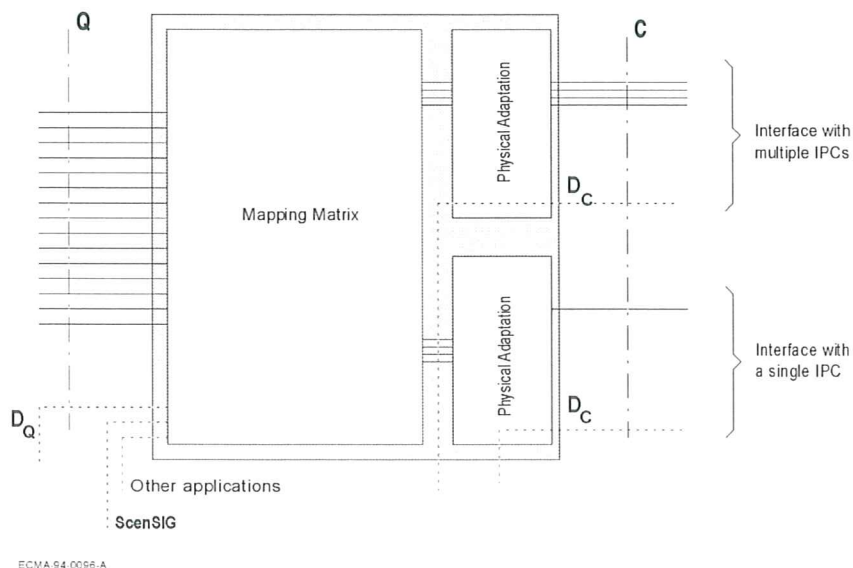


Figure 2 - Conceptual infrastructure of the Mapping functional grouping

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/de-multiplexing functions and/or splitting/merging functions. The Mapping matrix is under the control of the Mapping Management function, see 6.2.2.

If the bearer capabilities of the channels differ from those provided by the IPCs via Physical Adaptation, Mapping Matrix will also provide Bearer Conditioning. Bearer Conditioning is an optional function.

As a further option, the settings of Bearer Conditioning can be changed (Bearer Modification). If provided, Bearer Modification can modify any of the parameter values by which bearer capabilities are described, see annex A. Examples are given in table 1:

Table 1 - Examples of Attribute changes

Attribute	Change from/to ...	Application for ...
Information Transfer Mode	circuit \leftrightarrow packet	Accommodation of ScenSIG and QSIG, or packetized user data
Symmetry	unidirectional \leftrightarrow bi-directional symmetric	disabling echo cancellation for data transfer
Channel Rate	16 \leftrightarrow 32 \leftrightarrow 64 \leftrightarrow 128 \leftrightarrow etc. kbit/s	multiplexing/de-multiplexing to obtain higher or lower bandwidth
Information Transfer Coding	code conversion	μ -law/A-law/ADPCM

The attribute parameters for which Bearer Conditioning is possible, and the ranges of their values, depend on the PTNX implementation.

6.2 Inter-PTNX connection control (ICC)

The ICC provides control functions having either

- access significance, i.e. being relevant to the C-reference point; or
- link significance, i.e. being relevant to the peer PTNXs.

These are carried out by the subfunctions IPC Control and IPL Control respectively.

6.2.1 IPC control

These functions control the connections at the C-reference point. i.e. between the PTNX and the IVN. ICC communicates with the IVN's control mechanism by means of the access signalling information flows as specified for that particular type of IVN.

CSIG is used as a generic name for designating these signalling information flows.

6.2.2 IPL control

These functions are optional and provide a communication service to Scenario Management for interchanging IPL related information with its peer in the remote PTNX. The IPL related information flow is called ScenSIG. If it is provided, it is conveyed over an IPL Service Channel (IS).

ScenSIG is separate from the PTN call control information flows (QSIG). The communication services provided by ScenSIG allow the following tasks to be performed:

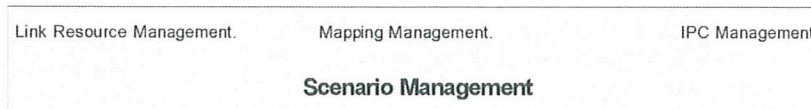
- confirmation that the establishment of the IPC for conveying ScenSIG was successful;
- identification of either PTNX to its peer;
- authentication, possibly with password exchange or encryption;
- agreement on establishing and releasing additional IPCs for the same IPL;
- agreement on establishment of the D_Q -channel on the same or a different IPC and any Bearer Conditioning to be applied;
- assignment of U_Q -channel identities, including the establishment of Bearer Conditioning, if required to satisfy the required bearer capabilities.

Some of the functions listed above can also apply to an existing IPL (after the initialization process), e.g. for adding or removing U_Q -channels or for changing their bearer capabilities.

6.3 Scenario management

This function (see figure 3) conceptually consists of three subfunctions, i.e.

- Link Resource Management;
- Mapping Management; and
- IPC Management.



ECMA-94-0088-A

Figure 3 - Scenario management

Scenario Management performs and coordinates the Link Resource Management, the Mapping Management and the IPC Management functions. Scenario Management evaluates requests for a new IPL or the enhancement of an existing IPL, and decides whether an additional IPC is to be established (IPC Management) or whether a suitable bearer capability can be obtained out of IPCs already available (Mapping Management).

The principal function of Scenario Management is to provide channels at the Q-reference point so that CC can select them according to users' requests. How Scenario Management achieves this, is outside the scope of this Technical Report.

NOTE 10

Basically, channel provisioning can be achieved in a forecast way, in which Scenario Management knows in advance the peak hour traffic pattern, i.e. how many channels are required.

Alternatively, channel provisioning can be achieved in a spontaneous way, in which Scenario Management controls the provision of the channels on request of CC.

A more sophisticated procedure of Scenario Management could be to instruct CC to apply a look-ahead procedure, i.e. to check (via QSIG) whether the party on PTNX B is actually available and free (e.g. does not have activated call diversion to another PTNX, and is not busy). Scenario Management will only establish the additional IPC, if the outcome of the look-ahead procedure was positive. This procedure forms an addition to the basic Scenario Management functions and is outside the scope of this Technical Report.

6.3.1 Link resource management

Link Resource Management is required whenever a PTNX needs to manage scenarios dynamically. It is responsible for ensuring the availability of an adequate number of channels with the required bearer capabilities at the Q-reference point, including updating the related data base.

As a local function, Link Resource Management is not subject to standardization.

6.3.2 Mapping management

Mapping Management is a function with significance at each end of the IPL. It is responsible for activating and de-activating the individual mapping functions, e.g. for obtaining bearer capabilities required for the channels at the Q-reference point different from those available at the interface(s) at the C-reference point.

Mapping Management is also responsible for the end-to-end coordination of the settings of mapping functions at the peer PTNXs. This requires information to be exchanged between their Scenario Management functional groupings. Such an exchange can be achieved manually or by signalling means. In the latter case, ICC will then have an IPL related control function which provides a communication service to Scenario Management. The communication service is based on information flows between the two peer PTNXs which generically are called ScenSIG. For the functions to be provided by the IPL related control function, see 6.2.2.

6.3.3 IPC management

IPC Management is responsible for setting up and releasing IPCs. This function applies to customer controllable IVN types only, e.g. a B-channel connection or a user-user-signalling connection through a public ISDN.

6.4 Complete PTNX model

Figure 4 shows the complete PTNX model composed of all individual functional groupings.

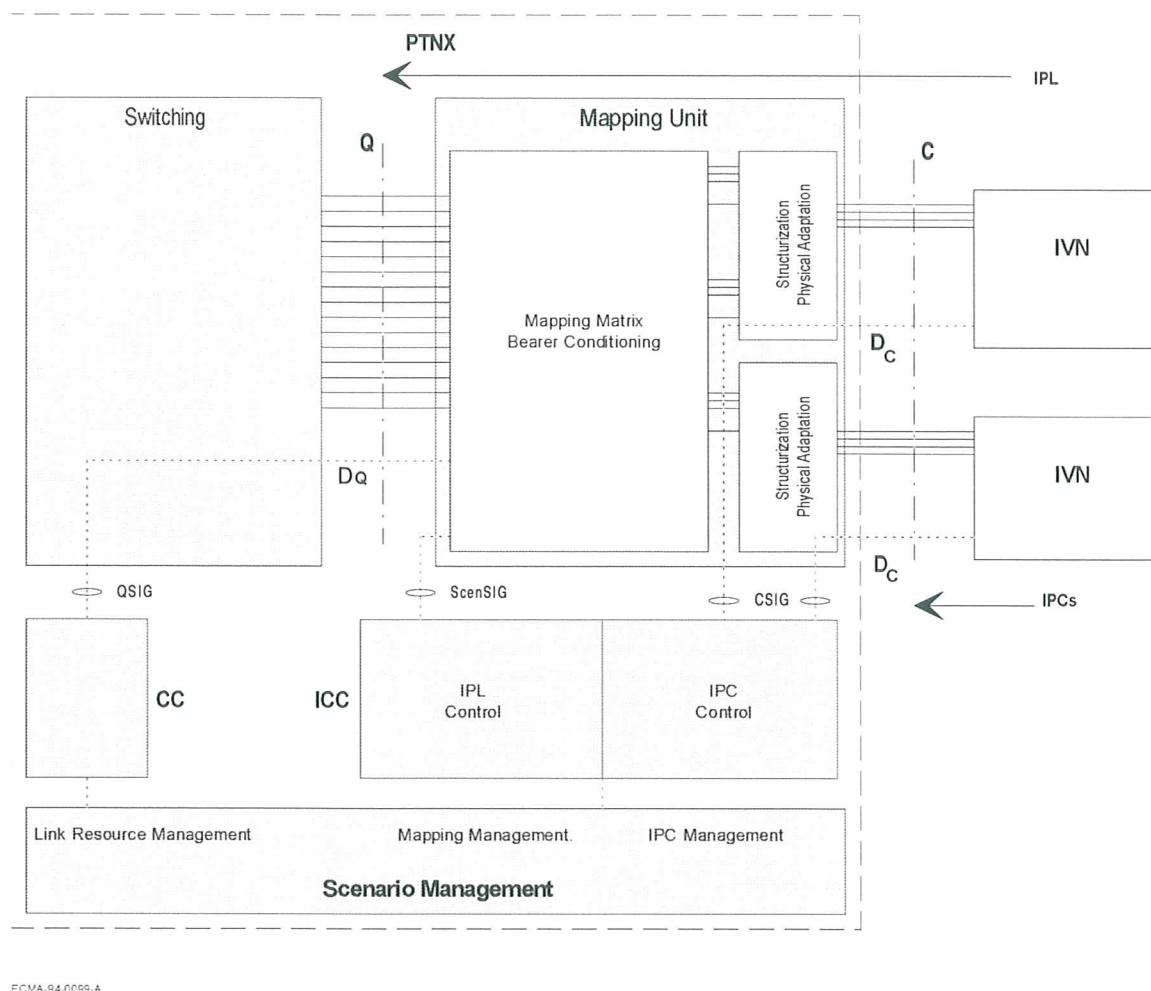


Figure 4 - Conceptual PTNX scenario handling functionality

7 Configuration variants

A number of configuration variants can occur in practice, which involve multiple instances of certain entities, e.g.:

- a PTNX has multiple IPLs, e.g. is interconnected with more than one PTNX;
- more than one type of IVN exists between two PTNXs;
- at each PTNX the IPCs of an IVN are spread differently among the available interfaces.

These situations can occur in any combination.

7.1 PTNX with multiple IPLs

A PTNX can have multiple IPLs, each terminated within the PTNX at its own instance of the Q-reference points. These IPLs may lead to the same peer PTNX or to different peer PTNXs. Different IPLs can be conveyed through the same or different IPCs.

An example of a PTNX with two IPLs linking its two peer PTNXs is shown in figure 5. The IPCs share the same IVN. According to ISO/IEC 11579, the instances of Q-reference point are marked by indexes, i.e. Q_0 , Q_1 , Q_2 .

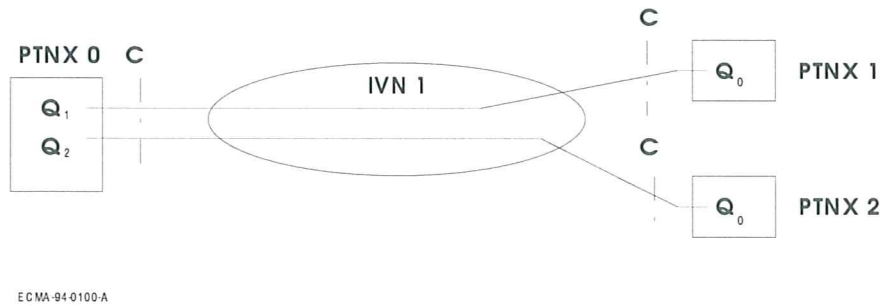


Figure 5 - Example of a PTN with multiple IPLs

7.2 More than one type of IVN

The channels of the IPL are conveyed via IPCs of different IVNs. Examples are:

- the base traffic is routed through leased lines, whereas the peak traffic between the two PTNXs is conveyed over switched connections of public ISDN equipment employed as an IVN.
- circuit mode calls are routed through leased lines, whereas packet mode calls and QSIG (and ScenSIG, if employed) are routed through a public switched packet data network employed as an IVN.

In this case multiple instances of the C-reference point relate to the single Q-reference point in each PTNX. Examples of multiple instances of C-reference point are given in figure 4.

7.3 Different spread of IPCs among the interfaces at the two PTNXs

The way in which IPCs are spread over the interfaces available at one PTNX can differ from the way in which the IPCs are spread over the interfaces available at the peer PTNX. In the case of public ISDN equipment, even the type of interface (basic or primary rate access) may be different at the two sides of the IVN.

Such a situation is shown in figure 6.

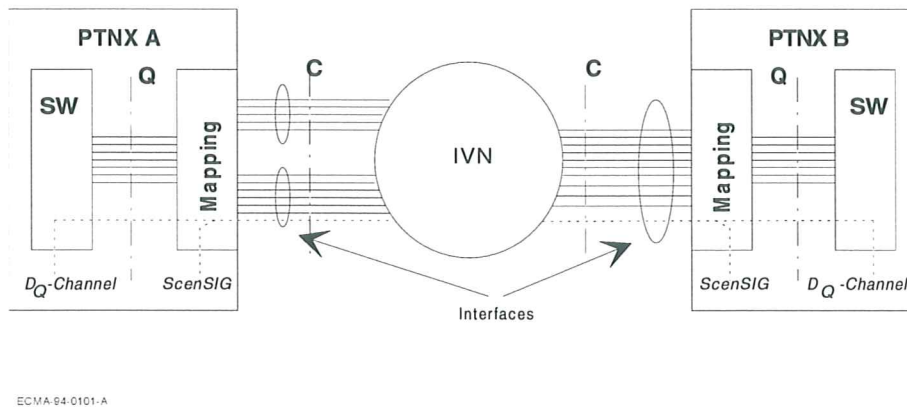


Figure 6 - Different interfaces at either side of the IVN

In this particular example the IPCs supporting the IPL are spread over two interfaces at PTNX A (one of which carries inter-PTNX signalling information) but use only one interface at PTNX B.

8 IPL establishment using ScenSIG

The steps involved in establishing an IPL using ScenSIG as the means of coordinating the two PTNXs are:

- static pre-conditions which must be coordinated and set in both PTNXs;
- the establishment of a first IPC between the two PTNXs;
- the IPL initialization process;
- the establishment of a D_Q-channel;
- the establishment of U_Q-channels.

The PTNX that initiates the establishment of an IPL is known as PTNX A and the peer PTNX is known as PTNX B.

8.1 Static pre-conditions

Scenario Management in PTNX A needs to know the following information in advance:

- the fact that its peer does exist;
- which scenario applies to the first IPC;
- a PTN number that will cause routeing to PTNX B's Scenario Management;
- if applicable, supplementary services that are to be used (e.g. Subaddressing, Closed User Group);
- if applicable, information needed for mutual identification and authentication via ScenSIG;
- what Bearer Conditioning needs to be provided for accommodating ScenSIG;
- information concerning how the D_Q-channel is to be provided;
- how many U_Q-channels are to be established initially and how these are to be provided.

The same applies to PTNX B. In addition, PTNX B also needs to be aware of whether CLIP is provided by the IVN, i.e. whether it should expect the IVN to provide it with the number of PTNX A's Scenario Management.

Both PTNXs need to know whether or not ScenSIG is to be involved in IPL establishment and/or to be used to convey mapping information.

The mechanisms for providing this knowledge to Scenario Management are outside the scope of this Technical Report.

8.2 Establishment of a first IPC

The Scenario Management of PTNX A shall set up a basic call connection, by means of CSIG, to the Scenario Management of its peer PTNX (PTNX B).

Since IPL establishment should work even when the IVN provides only basic services, access to the peer Scenario Management can only be achieved by a dedicated (preferably ex-directory) number of the IVN NP.

In addition to a basic call, and if supported by the IVN, further means can be used to reach PTNX B's Scenario Management entity and/or provide mutual identification, e.g.:

- a particular LLC and/or HLC code;
- a particular subaddress;
- a particular piece of information in a User-User message;
- the CLIP and COLP supplementary services of the IVN;
- a combination of the methods above.

NOTE 11

The types of information listed above can also provide enhanced security against accidental or fraudulent access to the PTNX management entity. The actual choice of security information, and its possible encryption, will depend on the availability of supporting supplementary services of the IVN. Statements on their characteristics and provision are outside the scope of this Technical Report.

The additional use of the CUG supplementary service to enhance access security to PTNX B should be studied.

NOTE 12

If the CUG supplementary service is used in combination with the DDI supplementary service of the IVN, both the public ISDN's and the PTN's CUG supplementary services need to be involved.

8.3 IPL initialization process

ScenSIG is used, via the first IPC, for the confirmation that this IPC has been successfully established. This will occur as soon as the underlying layer services are available to ScenSIG. With the interchange of confirmation, and possibly identification and authentication information (see 6.2.2), the IPL can be considered established.

8.4 Establishment of the D_Q-channel

QSIG can be conveyed on the first or on another IPC.

8.4.1 **D_Q-channel and ScenSIG on the first IPC**

The Scenario Management function of the initializing PTNX indicates, via ScenSIG, which multiplexing/de-multiplexing capability should be used for distinguishing between QSIG and ScenSIG. QSIG can then start up between the two CCs.

8.4.2 **D_Q-channel and ScenSIG on another IPC**

The two PTNXs agree, via ScenSIG, on the establishment of a new IPC for use as a D_Q-channel and on the Bearer Conditioning to be applied.

For any newly established IPC between the two peer PTNXs special precautions must be taken:

- to indicate to PTNX B that the incoming setup request concerns an IPC rather than a call setup to a PTN user (see 8.2);
- to prevent, or ensure correct handling of, collision of multiple simultaneous incoming setup requests for IPCs which belong to different IPLs (i.e. originating from other PTNXs);
- to avoid accidental or fraudulent access to PTNX B's CC by non-authorized users.

The *window technique* should be used as a method for matching these requirements. This technique employs the following procedure. The initializing PTNX's Scenario Management function announces, via ScenSIG, to PTNX B's Scenario Management function that it is about to establish a further IPC within the IPL already in use, together with a request for the indication of a special (preferably ex-directory) number of the IVN numbering plan (possibly with the addition of further security enhancements, as described in 8.2). A call to this number will be answered by PTNX B only during a defined time window, in which PTNX A must offer the new IPC via the IVN to PTNX B. PTNX B will not accept any setup requests to the same number other than with PTNX A's identity and any other supplementary service information as agreed, e.g. CLIP, subaddress.

After applying the agreed Bearer Conditioning, QSIG can start up between the two CCs.

To enable QSIG to be removed from its initial IPC to another one later during the lifetime of a scenario, ScenSIG will provide a negotiation function, so that both PTNXs can agree on such later change.

8.5 **Establishment of U_Q-channels**

Either PTNX can initialize channels independently of the direction of the initialization of the IPL to which the channel is to belong.

The establishment of an IPC to convey one or more U_Q-channels follows the same procedure as specified for the D_Q-channel; see 8.4.2. For each U_Q-channel the two PTNXs will agree, via ScenSIG, on a channel number, unique within the IPL, by which the channel can be referred to by QSIG.

U_Q-channels may be removed by agreement of the two PTNXs via ScenSIG.

8.6 **Channel mapping**

At IPL level, i.e. at the Q-reference point, all channels are unambiguously distinguishable.

Channels for signalling and user information transfer can be identified by mapping their identity at Q onto a channel or timeslot identity at a particular interface at the C-reference point. How this is achieved is a matter of local relevance only, and is thus left for individual implementation. Conceptually, the PTN Scenario Management function is responsible for obtaining and memorizing the identity mapping data.

The information on the allocation of the D_Q-channel to a particular channel or timeslot at the interface at the C-reference point is not interchanged via ScenSIG, but will be maintained in both PTNXs for the lifetime of the inter-PTNX link.

The same applies to U_Q-channels, except that the mapping information will only be kept for the lifetime of the particular U_Q-channel.

9 **IPL establishment procedures without using ScenSIG**

The steps involved in establishing an IPL without using ScenSIG as the means of coordinating the two PTNXs are similar to those in clause 8, with the exception that the IPL initialization step does not apply.

The PTNX that initiates the establishment of an IPL is known as PTNX A and the peer PTNX is known as PTNX B.

9.1 Static pre-conditions

Scenario Management in each PTNX needs to know the following in advance:

- that its peer exists;
- which scenario applies to the first IPC, which will be used for the D_Q-channel, and hence the Bearer Conditioning needed;
- which scenario applies to other IPCs, the Bearer Conditioning to be applied, and rules for numbering U_Q-channels;
- how many IPCs can be established;
- information needed to establish the first IPC (PTNX A will need to know a number that will cause routing to PTNX B's Scenario Management, and both PTNXs will need knowledge of supplementary services to be used);
- information needed to establish other IPCs.

The mechanisms for providing this knowledge to Scenario Management are subject to configuration management and are outside the scope of this Technical Report.

9.2 Establishment of a first IPC

The establishment of the first IPC is as described in 8.2.

9.3 Establishment of the D_Q-channel

The D_Q-channel is conveyed in the first IPC. After applying the required Bearer Conditioning, QSIG can start up between the two CCs.

9.4 Establishment of U_Q-channels

Any U_Q-channels on the first IPC automatically come into service after applying any Bearer Conditioning. A PTNX can establish a new IPC for one or more U_Q-channels using the pre-stored dedicated number and supplementary services, if any. On completion of establishment and application of any Bearer Conditioning the U_Q-channel(s) automatically come into service.

10 IPL administration procedures

Basically, the IPL administration procedures are the same as the IPL initialization procedures. If ScenSIG is employed for IPL establishment, it should also be used for IPL administration. These procedures include:

- Bearer Modification, if applicable;
- dis-establishment of U_Q-channels;
- re-establishment of U_Q-channels.

11 Items for future standardization

11.1 Static pre-conditions

Although setting of static pre-conditions is mandatory, the parameters and their values have local significance only, and no need is seen for the standardization of their structure or format.

NOTE 13

Setting, changing, structure and format of this data may be the subject of configuration management standardization. This is outside the scope of this Technical Report.

11.2 IVN bearer capabilities

Different types of network and different bearer capabilities offered by those networks need to be investigated for their suitability as IVNs and IVN Bearer Capabilities. Networks to be considered should include:

- Public ISDN;
- Leased lines;
- PSPDN.

Bearer capabilities to be considered should include:

- for QSIG and ScenSIG permanent and on-demand forms of circuit and packet mode;
- for U_Q-channels permanent and on-demand forms of circuit mode.

11.3 Physical adaptation

European and international standards specifying the following types of interfaces need to be investigated for their suitability as Physical Adaptation specifications:

- Digital leased line interfaces;
- ISDN basic access;
- ISDN primary rate access;
- Analogue leased lines.

Other types of interfaces are not precluded from future investigation.

11.4 Mapping matrix, including bearer conditioning

Standards should be produced for the mapping of IS-channels, D_Q-channels and U_Q-channels onto physically adapted interfaces, as well as the provision and the modification of Bearer Conditioning.

11.5 IPC establishment

The procedures for establishing and releasing IPCs and the use of supplementary services in this context should be investigated.

11.6 ScenSIG

The ScenSIG information flows and the means for their transfer need to be standardized. This includes:

- protocol architecture, e.g. separation from QSIG;
- functions, including:
 - acknowledgement process for successful IPC establishment;
 - identification procedures, parameters and values;
 - provisions for authentication, encryption;
 - negotiation procedures for Bearer Modification;
 - pre-announcement and negotiation procedure for establishing/dis-establishing IPCs for D_Q-channels and/or (further) U_Q-channels;
- the actual signalling protocol.

Annex A

Attribute values

The attribute technique is described in CCITT Rec. I.140. Table A.1 below contains examples of attribute values that can be applied to describe:

- the bearer capabilities of an IVN;
- the channel characteristics of a D_Q-/U_Q-channel and of an IS-channel.

Not all of the examples are equally appropriate to IPCs and to D_Q-/U_Q-channels.

Table A.1 - Examples of attributes and values

No.	Attributes	Values
1	Information Transfer Mode (operational mode for transferring information)	circuit packet ATM
2	Information Transfer Rate	bit rate (circuit mode) throughput rate (packet mode)
3	Information Transfer Capability (indicates restrictions of the type of information)	unrestricted digital information speech 3,1 kHz audio 7 kHz audio 15 kHz audio video other
4	Connection Establishment	demand semi-permanent permanent
5	Symmetry	unidirectional bi-directional symmetric bi-directional asymmetric
6	Connection Configuration (Description of the spatial arrangement for information transfer)	topology dynamics
7	Channel Rate	bit rate, e.g. 16, 32, 64, 128, 384 kbit/s
8	Structure	8 kHz integrity service data unit integrity timeslot sequence integrity restricted differential time delay unstructured
9	Connection Control Protocol, Information Transfer Coding/Protocol	ECMA-141 A-law / μ -law
10	Network Performance	Error and Slip.....
11	Type of IVN	ISDN PSTN X.25
12	Operations & Management	
13	Tariffing issues	

The values of item 9 in table A.1 depend on the channel usage. If the channel is used for signalling, the attribute value should indicate the appropriate bearer capability (e.g. a data link protocol like ECMA-141). If the channel is used for user information transfer, the attribute value should specify the type of physical layer intervention such as A-law / μ -law coding, speech compression, etc.

This ECMA Technical Report TR/65 is available free of charge from

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