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Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Use of QSIG at the C reference point between a PINX and an Interconnecting Network

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseaux privés à intégration de services — Emploi de QSIG au point de référence C entre un PINX et un réseau interconnecteur

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard 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 20161 was prepared by ECMA (as ECMA-318) and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

Annexes A and B form a normative part of this International Standard.

Introduction

This International Standard is one of a series of Standards defining services and signalling protocols applicable to Private Integrated Services Networks (PISNs). The series uses ISDN concepts as developed by ITU-T and conforms to the framework of International Standards for Open Systems Interconnection as defined by ISO/IEC.

This International Standard specifies the functional profile for interconnecting Private Integrated services Network eXchanges (PINXs) to VPN service centers to permit interoperability between equipment from different vendors and service providers.

This International Standard is based upon the practical experience of ECMA member companies and the results of their active and continuous participation in the work of ISO/IEC JTC 1, ITU-T, ETSI and other international and regional standardization bodies. It represents a pragmatic and widely based consensus.

Information technology — Telecommunications and information exchange between systems — Private Integrated Services Network — Use of QSIG at the C reference point between a PINX and an Interconnecting Network

1 Scope

This International Standard specifies the combination of base standards, together with the selection of appropriate options and parameter values, necessary to specify how QSIG / PSS1 can be used to provide digital signalling capabilities at interfaces at the C reference point between a Private Integrated services Network eXchange (PINX) and an Interconnecting Network (ICN) to permit interoperability between equipment from different vendors and different public or private service providers.

NOTE 1 - PINX in the sense of this International Standard is used in the meaning of a PINX directly attached to the ICN.

This International Standard is applicable to attached PINXs and Interconnecting Networks (ICN).

This International Standard identifies the necessary or optional employment of particular functions, procedures and services when provided:

- physical and electrical characteristics (physical layer) of the interfaces to the transmission systems to be employed;
- data link layer procedures;
- network layer procedures; and
- supplementary services and additional network features to meet specific corporate network user requirements.

This International Standard states requirements upon attached PINXs and Interconnecting Network (ICN) implementations in order to achieve interoperability between equipment in PISNs serving as Corporate telecommunication Networks (CNs).

NOTE 2 - Implementation of this International Standard does not preclude a manufacturer from offering other means of interconnection. It also does not preclude a VPN service provider to offer basic call communications between a PINX and other networks like PSTN or ISDN.

ISO/IEC TR 14475 specifies various access arrangements between a PINX and a public network where reference points C and T reside either at a single or at separate interfaces. The scope of this International Standard is limited to cover the C reference point aspects at a separate interface.

The current version of this International Standard does not intend to specify any gateway or end PINX requirements for the ICN side of the interface. Therefore it typically uses the term "virtual transit PINX" instead of Interconnecting Network (ICN).

2 Conformance

A system conforms to this International Standard if it correctly performs all the mandatory capabilities defined in the requirement list (RL) (annex A) and the profile specific ICS (annex B).

NOTE 3 - For the purpose of this International Standard capabilities marked as optional in the base standards may be mandatory or excluded.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

3.1 References of general significance

ECMA-133:1998, *Private Integrated Services Network (PISN) - Reference Configuration for PISN Exchanges (PINX) (International Standard ISO/IEC 11579-1)*

ECMA-143:1997, *Private Integrated Services Network (PISN) - Circuit Mode Bearer Services - Inter-Exchange Signalling Procedures and Protocol (International Standard ISO/IEC 11572)*

ECMA-155:1997, *Private Integrated Services Network - Addressing (International Standard ISO/IEC 11571)*

ECMA-165:1997, *Private Integrated Services Network (PISN) - Generic Functional Protocol for the Support of Supplementary Services - Inter-Exchange Signalling Procedures and Protocol (International Standard ISO/IEC 11582)*

ECMA-226:1995, *Private Integrated Services Network (PISN) - Mapping Functions for the Employment of Dedicated Circuit Mode Connections as Inter-PINX Connections*

ECMA-253:2000, *Private Integrated Services Network (PISN) - Mapping Functions for the Employment of 64 kbit/s Circuit Mode Connections with 16 kbit/s Sub-Multiplexing (International Standard ISO/IEC 17310)*

EN 300 172:1997, *Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Circuit mode basic services [ISO/IEC 11572 (1996) modified]*

ETS 300 239:1995, *Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Generic functional protocol for the support of supplementary services [ISO/IEC 11582 (1995) modified]*

EN 300 402-4:1999, *Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Data link layer; Part 4: Protocol Implementation Conformance Statement (PICS) proforma specification for the general protocol*

ISO/IEC 9646-7:1995, *Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements*

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 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*

ISO/IEC 14474:1998, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Functional requirements for static circuit-mode inter-PINX connections*

ISO/IEC TR 14475:2001, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Architecture and scenarios for Private Integrated Services Networking*

ITU-T Rec. E.164:1997, *The international public telecommunication numbering plan*

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.140:1993, *Attribute technique 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.430:1995, *Basic user-network interface - Layer 1 specification*

ITU-T Rec. I.431:1993, *Primary rate user-network interface - Layer 1 specification*

ITU-T Rec. Q.920:1993, *ISDN user-network interface data link layer - General aspects*

ITU-T Rec. Q.920:1993/Amd.1:2000

ITU-T Rec. Q.921:1997, *ISDN user-network interface - Data link layer specification*

ITU-T Rec. Q.921:1997/Amd.1:2000

3.2 References to supplementary services and ANFs

ECMA-174:1997, *Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Call Diversion Supplementary Services (CFB, CFNR, CFU) (International Standard ISO/IEC 13873)*

ECMA-176:1998, *Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Path Replacement Additional Network Feature (PR) (International Standard ISO/IEC 13874)*

ECMA-178:1997, *Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Call Transfer Supplementary Service (CT) (International Standard ISO/IEC 13869)*

ECMA-212:1997, *Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Advice of Charge Supplementary Services (AOC) (International Standard ISO/IEC 15050)*

ECMA-221:1997, *Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Call Interception Additional Network Feature (CINT) (International Standard ISO/IEC 15054)*

ECMA-225:1997, *Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Transit Counter Additional Network Feature (TC) (International Standard ISO/IEC 15056)*

ECMA-264:1998, *Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Call Priority Interruption and Call Priority Interruption Protection Supplementary Services (SSCPI) (International Standard ISO/IEC 15992)*

ECMA-284:2000, *Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Private User Mobility (PUM) - Call Handling Additional Network Feature (PUMCH) (International Standard ISO/IEC 17878)*

ECMA-300:2000, *Private Integrated Services Network (PISN) - Inter-Exchange Signalling Protocol - Single Step Call Transfer Supplementary Service (SSCT) (International Standard ISO/IEC 19460)*

ISO/IEC 15431:1999, *Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Inter-exchange signalling protocol - Wireless terminal call handling additional network features*

4 Definitions

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

4.1 External definitions

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

- Attached PINX (ISO/IEC 14475)
- Destination PINX (ECMA-165)
- End PINX (ECMA-165)
- Gateway PINX (ECMA-143)
- Incoming Call (ECMA-143)
- Inter-PINX Connection (ECMA-253)
- Inter-PINX Link (ECMA-253)
- Originating PINX (ECMA-143)
- Outgoing Call (ECMA-143)
- Preceding PINX (ECMA-165)
- Private Integrated Services Network (PISN) (ECMA-133)
- Private Integrated Services Network Exchange (PINX) (ECMA-133)
- C reference point (ECMA-133)
- Q reference point (ECMA-133)
- Side, Incoming Side and Outgoing Side (ECMA-143)
- Source PINX (ECMA-165)
- Subsequent PINX (ECMA-165)
- Terminating PINX (ECMA-143)
- Transit PINX (ECMA-143)

4.2 Interconnecting Network : Interconnecting Network (ICN): That part of a third party provided network, e.g. a public network, which provides the functions needed to interconnect PINXs. The functionality of the ICN includes transit PINX functionality, associated transmission capabilities and may include gateway PINX functionality.

4.3 Virtual Transit PINX : Virtual Transit PINX: an Interconnecting Network performing only Transit PINX functions.

5 Acronyms

ANF	Additional Network Feature
APDU	Application Protocol Data Unit
ASN.1	Abstract Syntax Notation One
BC	Basic Call
CN	Corporate telecommunication Network
EN	European Norm
ETS	European Telecommunication Standard
GF	Generic Functional protocol (for the support of supplementary services)
GW	GateWay
i	Irrelevant
ICN	InterConnecting Network
M, m	Mandatory
MP	MaPping
N/A, n/a	Not Applicable
NFE	Network Facility Extension
O, o	Optional
o.i	Optional, qualified
PINX	Private Integrated services Network eXchange
PISN	Private Integrated Services Network
PNP	Private Numbering Plan
PSTN	Public network infrastructure
QSIG	Q reference point SIGnalling system
RL	Requirements List
SS	Supplementary Service
SM/SREJ	Set Mode / Selective REJect
TCC	Transit Call Control
TEI	Terminal Endpoint Identifier
UDI	Unrestricted Digital Information
VPN	Virtual Private Network
X	Not supported / not used
x	eXcluded

6 Specification framework

6.1 Scenarios

Figure 1 below shows an example scenario where the Interconnecting Network (ICN) is located within a public network and provides virtual transit PINX functionality.

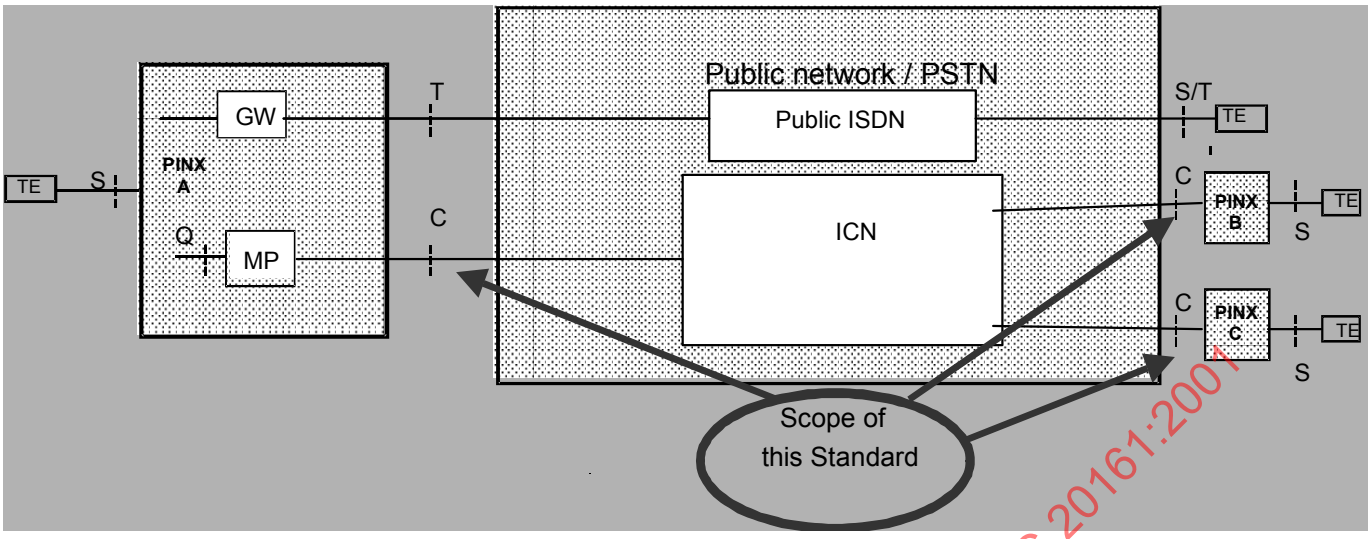

Figure 1 - Example Scenario

7 Physical interfaces and protocol stack at the C reference point

Figure 1 above also shows the "C reference points" at which physical interfaces may occur. This International Standard defines the required behaviour at a physical interface at the C reference point. Figure 2 below shows the protocol stack applicable at the C reference point.

	PISN User Plane (User information)		PISN Control Plane (Signalling)
	Data	Voice	PISN Call Control and Supplementary Services as referenced in clause 10.4 (SSs and ANFs)
Network layer			QSIG / PSS1 Protocol Control as referenced in clause 10.2 (Basic Call) and 10.3 (GF)
Data link layer			Symmetric LAP-D as referenced in clause 9
Physical layer	User (B-) Channel: 64 kbit/s / Signalling (D-) Channel: 16/64 kbit/s (Basic or Primary Rate Interface) as referenced in clause 8		
	Physical Transmission Medium		

Figure 2 - Protocol Stack

8 Layer 1 Requirements

8.1 General

Typical customer networks (e.g. branch offices etc.) require interconnections of differently scaled PINXs via the ICN. Therefore the ICN shall support both, Primary Rate Access and Basic Access.

In general the configuration parameters for the T reference point as specified in ITU-T Recommendations I.430 for Basic Access and I.431 for Primary Rate Interface shall also apply at interfaces at the C reference point, with the restrictions as stated below.

8.2 Basic Access ($2xB_{64}+D_{16}$)

When a basic access is offered at the C reference point ITU-T Recommendation I.430 applies to both sides of the interface. As the requirement for the basic access is depending on a particular PINX configuration, public networks claiming conformance to this International Standard shall generally offer the capability for application of basic rate interfaces.

It is recommended to keep Layer 1 permanently active.

NOTE 4 - This recommendation is made in order to avoid frequent synchronization and re-synchronization of the attached PINX. In addition an active layer 1 allows the attached PINX to easily choose a line for the establishment of a call and it helps decreasing the setup time for a call.

The D_Q-channel allocation to time slots shall be fixed according to sub-clauses 8.1.2 / 8.2.1.2 of Standard ECMA-226.

8.3 Primary Rate Access

When a primary rate access is offered at the C reference point ITU-T Recommendation I.431 applies to both sides of the interface. As the requirement for the primary rate access is depending on a particular PINX configuration, public networks claiming conformance to this International Standard shall generally offer the capability for application of one of the following primary rate interfaces.

NOTE 5 - In case of either primary rate access, layer 1 is always permanently active.

8.3.1 2048 kbit/s Primary Rate Access ($30xB_{64}+D_{64}$)

The D_Q-channel allocation to time slots shall be fixed to timeslot 16 according to sub-clauses 8.1.1 / 8.2.1.1 of Standard ECMA-226.

8.3.2 1544 kbit/s Primary Rate Interface ($23xB_{64}+D_{64}$)

The D_Q-channel allocation to time slots shall be fixed to timeslot 24 according to ISO/IEC 14474.

9 Layer 2 Requirements

The following layer 2 requirements apply at interfaces at the C reference point:

Layer 2 on the D_Q-channel shall be according to the symmetrical application in Annex A of ITU-T Rec. Q.920, Amendment 1: 2000, and Annex J of ITU-T Rec. Q.921, Amendment 1: 2000, and master / slave shall be configurable.

The SM / SREJ option, defined in Annex E of ITU-T Rec. Q.921, shall not apply.

While the PINX side has the choice of applying the TEI Management according to ITU-T Rec. Q.921 Annex A, where alternatively no TEI management is required for point-to-point configurations with TEI 0, the virtual transit PINX shall be configurable to accept both alternatives.

While the PINX side has the choice of applying the limited TEI Management as for the T reference point, the virtual transit PINX shall be configurable to accept both alternatives.

For use at basic accesses the window size (k) shall be 1. The window size for primary rate interfaces shall be configurable for 1, 3 or 7, respectively, under the assumption that both sides when interconnected have chosen the same value.

10 Layer 3 Requirements

10.1 General

The following layer 3 requirements apply at interfaces at the C reference point. If a functionality which is qualified as optional is provided, it shall be in accordance with the referenced standards.

10.1.1 Addressing and Routeing

The support of addressing according to Standard ECMA-155 is mandatory for attached PINXs as well as for virtual transit PINXs.

The virtual transit PINX shall support numbering plan identifications set to “E.164” and to “unknown”.

The virtual transit PINX may also support numbering plan identification set to “PNP”.

The choice of selecting among the available options is up to the attached PINX side of the interface.

NOTE 6 - For the virtual transit PINX the support of each customer's numbering plan (PNP or "unknown") requires management functionality which is out of scope of this International Standard.

If explicit numbering plan (E.164 or PNP) is supported, a virtual transit PINX shall support all values of the type of number fields in the calling, called, and connected party number information elements and in numbers in SS/ANF APDUs. The actual type of number value to be used is determined by the requirements of the corporate network. Whichever value is supplied, a virtual transit PINX shall process it without modification.

Number information (e.g. called / calling / connected party number, including numbers in SS/ANF APDUs) shall not be screened, modified nor truncated by the virtual transit PINX.

Numbering plan identification and type of number shall not be modified by the virtual transit PINX.

10.2 Basic Call

The following standards for Basic Call (BC) are further referred to as QSIG / PSS1 BC.

ISO/IEC 11572 shall apply to both sides of the interface.

NOTE 7 - For the purpose of this Profile Standard, interface implementations complying with ISO/IEC 11572:1997 (Edition 2, including Amendment 1, Amendment 2 and Defect Report 0) or later, can be considered to comply with the above requirement. Implementations of the 1st edition of ISO/IEC 11572 or of the 2nd edition without the mentioned amendments and defect report cannot meet the requirements of this Profile Standard.

Implementations complying with EN 300 172 (Version 1.4.1 or later) or ECMA-143 (3rd edition, 1997 or later) can also be considered to comply.

In particular, if not otherwise stated in this International Standard, the "Transit PINX procedures" specified in the standards mentioned above (§ 10.4) shall be supported by the virtual transit PINX.

A virtual transit PINX shall through-connect the B-channel in both directions of transmission on receipt of the first message in response to SETUP indicating the B-channel to be used (§ 10.4.5).

A virtual transit PINX shall not discard any PROGRESS message received in the TCC_Call Active state (§ 10.4.9).

A virtual transit PINX, on receipt of a DISCONNECT, RELEASE, or RELEASE COMPLETE message from the attached PINX prior to reaching the TCC_Call Alerting state shall not attempt "other (unspecified) procedures" (§ 10.4.10.1).

A virtual transit PINX, on receipt of a CONNECT message from the attached PINX, shall send a CONNECT ACKNOWLEDGE message, even if by mutual agreement timer T313 is not implemented. (§ 10.1.6).

10.2.1 Segmentation and reassembly

Application of the QSIG / PSS1 segmentation and reassembly procedure is mandatory for the virtual transit PINX. The implementation shall support the maximum segment length of 260 octets and 8 segments as defined for QSIG/PSS1 BC.

For the attached PINX the support of reassembly and segmentation is optional.

10.2.2 Channel Identification

In addition to the specifications made by the base standard for QSIG / PSS1 BC, the support of Channel map is mandatory for the virtual transit PINX.

10.2.3 En-bloc, Overlap Sending / Receiving

NOTE 8 - Despite the typical restrictions on the number length (e.g. in E.164), a particular PISN may request the transport of longer digits sequences by means of overlap sending.

10.2.4 Sub-addressing

For sub-addressing information elements the maximum length of 23 octets shall be transported transparently by virtual transit PINXs.

10.2.5 Causes

Causes as defined in QSIG/PSS1 BC shall apply. All causes received from an attached PINX shall be passed transparently through the virtual transit PINX. Certain situations (e.g. congestion within the ICN) require the generation of specific causes by the virtual transit PINX. Location information for such causes shall be "transit network".

10.2.6 Bearer Services

The bearer services speech, 3.1kHz audio and UDI (unrestricted digital information) shall be supported by the virtual transit PINX. Additional bearer services may be offered based on mutual agreement.

NOTE 9 - Within virtual transit PINXs the use of compression may be restricted due to the indicated Bearer Service and the Quality of Service demands.

10.2.7 Progress Indicator

All progress indications received from an attached PINX shall be passed transparently through the virtual transit PINX. Certain situations (e.g. congestion within the ICN) require the generation of progress indicator #8 by the virtual transit PINX. Location information for this progress indication shall be "transit network".

Additional Progress descriptions (according to Annex ZB of ECMA-143 (3rd edition, 1997 or later)) shall not be generated by virtual transit PINXs.

The maximum number of progress indicators transported by one QSIG / PSS1 message shall be supported by the virtual transit PINX.

10.2.8 Codeset

The support of all codesets from codeset 0 to 7 is mandatory.

10.3 Generic Functional Protocol (GF)

The following standards for Generic Functional Protocol are further referred to as QSIG/PSS1 GF.

ISO/IEC 11582 shall apply to both sides of the interface.

NOTE 10 - For the purpose of this Profile Standard, interface implementations complying with ISO/IEC 11582: 1995 (Edition 1) or later, can be considered to comply with the above requirement. Implementations complying with ETS 300 239: 1995 (Edition 2) "ISO/IEC 11582 modified" or ECMA-165 (3rd edition, 1997 or later) can also be considered to comply.

Implementations of ECMA-165 Edition 1 cannot meet the requirements of this Profile Standard.

However, it is recommended to apply the same Standard at all interfaces at all C reference points of the virtual transit PINX used by a single PISN, to avoid possible restrictions in terms of functionality.

Additionally it is recommended, that only corresponding standards for Generic Functional Protocol and Basic Call are applied together as combinations, i.e. either

- ISO/IEC 11582 for GF with ISO/IEC 11572 for Basic Call, or
- ECMA-165 for GF with ECMA-143 for Basic Call, or
- ETS 300 239 for GF with EN 300 172 for Basic Call.

In particular, if not otherwise stated in this International Standard, the "Transit PINX procedures" specified in the standards mentioned above shall be supported by the virtual transit PINX.

10.3.1 Important issues from the PISN point of view

In context with implementations at interfaces at the C reference point the following functions require special consideration.

10.3.1.1 Call related transport mechanism

Call related signalling shall be supported.

10.3.1.2 Connectionless call independent transport mechanism

Connectionless call independent signalling may be supported by the virtual transit PINX based on mutual agreement between the parties involved.

10.3.1.3 Connection oriented call independent transport mechanism

Connection oriented call independent signalling shall be supported by the virtual transit PINX.

10.3.1.4 Manufacturer Specific Information

Transport of manufacturer specific information shall be supported by the virtual transit PINX.

New (proprietary) operations shall be treated as manufacturer specific information according to ECMA-165.

10.3.1.5 Notify and Facility Messages

Unless otherwise specified in section 10.4 of this International Standard, NOTIFY and FACILITY messages shall be transported transparently by the virtual transit PINX.

10.3.1.6 Notification Indicator Information Element

The transparent transport of notification information shall be supported by the virtual transit PINX.

10.3.1.7 Facility Information Element

The maximum length of facility information element as specified in QSIG/PSS1 GF shall be supported by the virtual transit PINX.

The number of facility information elements shall be limited only by the max. layer 3 message length, thereby considering the applicability of the message segmentation procedure leading to a maximum of 8 segments.

10.4 Supplementary Services and Additional Network Features

The virtual transit PINX shall act as a Transit PINX for supplementary services and ANFs.

Typically, apart from the transport of APDUs, the application of a supplementary service or ANF in the attached PINXs requires no special procedures by the virtual transit PINX, with the exceptions specified in the subclauses below.

NOTE 11
Customers may request to interconnect PINXs with implementations of different standards for SSs and ANFs via an interconnecting network to form a PISN. Such applications are not precluded. However, it is recommended to apply the same standards at all interfaces at all C reference points of the virtual transit PINX used by a single PISN, in order to avoid possible restrictions in terms of functionality.

Additionally it is recommended, that only corresponding standards for supplementary services and ANFs, Generic Functional Protocol, and Basic Call are applied together as combinations, i.e. either

- ISO/IEC supplementary services and ANFs with ISO/IEC 11582 for GF and ISO/IEC 11572 for Basic Call, or
- ECMA supplementary services and ANFs with ECMA-165 for GF and ECMA-143 for Basic Call, or
- ETSI supplementary services and ANFs with ETS 300 239 for GF and EN 300 172 for Basic Call.

10.4.1 Procedures required at the virtual transit PINX for Advice of Charge (AOC)

The transparent transport of QSIG / PSS1 AOC information is mandatory.

The virtual transit PINX shall not generate any Advice of Charge information.

NOTE 12 - If applicable, AOC received at a gateway PINX is interworked according to QSIG / PSS1 procedures before being transported through the virtual transit PINX.

10.4.2 Procedures required at the virtual transit PINX for Call Diversion (CFB, CFNR, CFU)

If the virtual transit PINX acts as Rerouteing PINX, it shall support all interactions with other supplementary services and ANFs.

10.4.3 Procedures required at the virtual transit PINX for Call Transfer (CT)

If the virtual transit PINX acts as Rerouteing PINX, it shall support all interactions with other supplementary services and ANFs.

10.4.4 Procedures required at the virtual transit PINX for Path Replacement (PR)

If the virtual transit PINX acts as Inviting PINX, it shall support all interactions with other supplementary services and ANFs.

10.4.5 Procedures required at the virtual transit PINX for Call Interception (CINT)

If the virtual transit PINX acts as Intercepting PINX, it shall support all interactions with other supplementary services and ANFs.

10.4.6 Procedures required at the virtual transit PINX for Transit Counter (TC)

Support of Standard ECMA-225 is mandatory for the virtual transit PINX.

The transit counter value shall be incremented by 1 by the virtual transit PINX.

10.4.7 Procedures required at the virtual transit PINX for Private User Mobility - Call Handling (PUMCH)

If the virtual transit PINX acts as PUMI Rerouteing PINX, it shall support all interactions with other supplementary services and ANFs.

10.4.8 Procedures required at the virtual transit PINX for Wireless Terminal Call Handling (WTMCH)

If the virtual transit PINX acts as WTMI detect PINX, it shall support all interactions with other supplementary services and ANFs.

10.4.9 Procedures required at the virtual transit PINX for Single Step Call Transfer (SSCT)

If the virtual transit PINX acts as Rerouteing PINX, it shall support all interactions with other supplementary services and ANFs.

10.4.10 Procedures required at the virtual transit PINX for Call Priority Interruption (CPI)

If the virtual transit PINX acts as Interrupting PINX, it shall support all interactions with other supplementary services and ANFs.

10.5 Keypad and Feature key Procedures

The application of either the keypad or the feature key procedure as specified in various standards for the S and S/T reference point shall not be supported at the C reference point.

Annex A

(normative)

Requirements List (RL)

A.1 General

Use of this International Standard imposes requirements on the implementation that go beyond those of the base standards referred to by this International Standard. These result in modifications to the requirements expressed in the PICS proformas for the base standards. This annex specifies the modifications (the Requirements List - RL) that apply to the status of the items affected in each PICS proforma, with consequently modified requirements on the answers to be provided.

The status notation used in this annex is that defined in ISO/IEC 9646-7. In summary, the meaning of the notations is as follows:

i Irrelevant or out-of-scope - this capability is outside the scope of this profile and is not subject to conformance testing in this context.

m Mandatory - the capability is required to be supported.

n/a Not Applicable - in the given context, it is impossible to use the capability.

o Optional - the capability may be supported or not.

o.i qualified optional - for mutually exclusive or selectable options from a set. "i" is an integer that identifies an unique group of related optional items and the logic of their selection, defined below the table.

x eXcluded or prohibited - there is a requirement not to support this capability in this profile.

The Requirements List in this Annex shall be used to restrict the permitted support answers in the corresponding PICS.

A.2 Relationship between RL and corresponding PICS proformas

In the context of the profile specification contained in this International Standard, PICS proformas of the base protocol standards contain items in 3 categories. The 3 categories are:

- those proforma items where this profile does not restrict the permitted support answers;
- those proforma items where this profile restricts the permitted support answers;
- those proforma items that are not relevant to this profile.

The Requirements List consists of the items falling into the second category, with an indication of the modified status in those items.

A.3 Requirements List

A.3.1 Tables for the data link layer (control plane)

Item number and references refer to annex B of EN 300 402-4.

A.3.1.1 Roles

Item	Question/Feature	Reference	Protocol Status	Profile Status attached PINX	Profile Status virtual transit PINX
R6.1	basic access	A.6	o.2	o.2	o.2
R6.2	primary rate access	A.6	o.2	o.2	o.2

A.3.2 Tables for the network layer (control plane)

A.3.2.1 Basic Call

Item numbers and references refer to ECMA-143 (ISO/IEC 11572).

A.3.2.1.1 Bearers supported

Item	Question/Feature	Reference	Protocol Status	Profile Status attached PINX	Profile Status virtual transit PINX
Z1	Support of the 64 kbps unrestricted bearer	14.5.5	o.1	o.3	m
Z2	Support of the 64 kbps bearer with speech transfer capability	14.5.5	o.1	o.3	m
Z3	Support of the 64 kbps bearer with 3.1 kHz audio transfer capability	14.5.5	o.1	o.3	m
Z4	Support of the Multi-rate Unrestricted Bearer	14.5.5	o.1	o.3	o

A.3.2.1.2 Circuit switched call control

Item	Question/Feature	Reference	Protocol Status	Profile Status attached PINX	Profile Status virtual transit PINX
B1	Is the implementation capable of functioning as an Originating PINX ?	10.5	o.2	o.4	x
B2	Is the implementation capable of functioning as an Incoming Gateway PINX ?	10.7	o.2	o.4	x
B3	Is the implementation capable of functioning as a Transit PINX ?	10.4	o.2	o.4	m
B4	Is the implementation capable of functioning as a Terminating PINX ?	10.6	o.2	o.4	x
B5	Is the implementation capable of functioning as an Outgoing Gateway PINX ?	10.8	o.2	o.4	x
B6	Support procedures for call request	10.1.1	(B1 OR B2 OR B3): m	(B1 OR B2 OR B3): m	B3: m
B9	Overlap Receiving procedures	10.1.3	(B3 OR B4 OR B5): m	(B3 OR B4 OR B5): m	B3: m
B10	Overlap Sending procedures	10.1.3	(B1 OR B2 OR B3): m	(B1 OR B2 OR B3): m	B3: m
B17	Sending of call progress information during call establishment	10.1.7	(B3 OR B4 OR B5): o	(B3 OR B4 OR B5): o	B3: m

A.3.2.1.3 Messages and information elements for general procedures

Item	Question/Feature	Reference	Protocol Status	Profile Status attached PINX	Profile Status virtual transit PINX
J21	Support of channel map	14.5.12	o	o	m
J21A	Numbering plan identification supported: E.164 PNP Unknown	14.5.7	o	 o.5 o.5 o.5	 m o m
J22A	Type of number supported for ISDN/Telephony Numbering Plan (E.164) in calling and connected party number: Unknown International number National number Subscriber number	14.5.7	o	 o.6 o.6 o.6 o.6	 m m m m
J23A	Type of number supported for Private Numbering Plan in calling and connected party number: Unknown Level 2 regional number Level 1 regional number PISN specific number Level 0 regional number Abbreviated number	14.5.7	o	 o.7 o.7 o.7 o.7 o.7 o.7	 m m m m m m

A.3.2.2 Generic Functional Protocol

Item numbers and references refer to annex A of ECMA-165 (ISO/IEC 11582).

A.3.2.2.1 Call related protocol control and GFT-Control requirements

Item	Question/Feature	Reference	Protocol Status	Profile Status attached PINX	Profile Status virtual transit PINX
A7	Can the PINX act as an Originating, Terminating, Incoming or Outgoing Gateway PINX as defined in ECMA-143 (ISO/IEC 11572) ?	4 & ECMA-143 (ISO/IEC 11572)	o.1	o.8	x
A10	Can the PINX act as a Transit PINX as defined in ECMA-143 (ISO/IEC 11572) ?	4 & ECMA-143 (ISO/IEC 11572)	o.1	o.8	m
A12	Can the implementation generate notification information ?	7.4	o	o	n/a

A.3.2.2.2 Connectionless ADPU transport mechanism

Item	Question/Feature	Reference	Protocol Status	Profile Status attached PINX	Profile Status virtual transit PINX
B1	Does the PINX support Connectionless APDU transport?	7.2	o	o	o
B7	Actions as a Source PINX	7.2.2.1	B1: o	B1: o	n/a

A.3.2.2.3 Connection oriented APDU transport mechanism

Item	Question/Feature	Reference	Protocol Status	Profile Status attached PINX	Profile Status virtual transit PINX
C1	Does the PINX support connection-oriented APDU transport?	7.3	o	o	m
C2	Can the implementation act as a Source PINX for APDUs when supporting the Connection oriented APDU transport mechanism ?	7.3	C1: o	C1: o	o
C4	Actions at an Originating PINX	7.3.3.1	C1: o	C1: o	x
C6	Actions at a Terminating PINX	7.3.3.3	C1: o	C1: o	x

A.3.2.2.4 Manufacturer specific information

Item	Question/Feature	Reference	Protocol Status	Profile Status attached PINX	Profile Status virtual transit PINX
H1	Manufacturer specific operations	9.1	o	o	n/a
H2	Manufacturer specific additions to standardized operations	9.2	o	o	n/a
H3	Manufacturer specific notifications	9.3	o	o	n/a

A.3.3 Supplementary Services and ANFs

Item numbers, except C2, refer to annexes A of the ECMA standards mentioned in the Reference column. Item number C2 refers to section A.3.2.2.3 in this International Standard.

Item	Question/Feature	Reference	Protocol Status	Profile Status attached PINX	Profile Status virtual transit PINX
A1, A2	Support of QSIG / PSS1 Advice of Charge (AOC)	ECMA-212 ISO/IEC 15050	o	o	m
	Generation of any Advice of Charge information			o	x
B3	Behaviour as a Rerouteing PINX for Call Diversion SSs (CFB, CFNR, CFU, CD)	ECMA-174 ISO/IEC 13873	o	o	C2: o
E1 - J10	Support of interactions of CFB, CFNR, CFU, CD with other SSs and ANFs	ECMA-174 ISO/IEC 13873			B3: m
C1	Behaviour as a Rerouteing PINX for Call Transfer (CT)	ECMA-178 ISO/IEC 13869	o	o	C2: o
E1 - F4	Support of interactions of CT with other SSs and ANFs	ECMA-178 ISO/IEC 13869			C1: m
A7	Behaviour as an Inviting PINX for Path replacement (PR)	ECMA-176 ISO/IEC 13874	o	o	C2: o
E1	Support of interactions of PR with other SSs and ANFs	ECMA-176 ISO/IEC 13874			A7: m
B4, B5	Behaviour as an Intercepting PINX for Call Interception CINT)	ECMA-221 ISO/IEC 15054	o	o	C2: o
D1 - K2	Support of interactions of CINT with other SSs and ANFs	ECMA-221 ISO/IEC 15054			B4,B5: m
A5, A6	Behaviour as a Transit PINX for ANF Transit Counter (TC)	ECMA-225 ISO/IEC 15056	o	o	m
	Incrementation of transit counter value	ECMA-225 ISO/IEC 15056	o	o	m
A8	Behaviour as a PUMI rerouteing PINX for Private User Mobility - Call Handling (PUMCH)	ECMA-284 ISO/IEC 17878	o	o	C2: o
E1 - Q3	Support of interactions of PUMCH with other SSs and ANFs	ECMA-284 ISO/IEC 17878			A8: m
A1	Behaviour as a WTMI detect PINX for Wireless Terminal Call Handling (WTMCH)	ISO/IEC 15431	o	o	C2: o
E1 - I2	Support of interactions of WTMCH with other SSs and ANFs	ISO/IEC 15431			A1: m
A2	Behaviour as a Rerouteing PINX for Single Step Call Transfer (SSCT)	ECMA-300 ISO/IEC 19460	o	o	C2: o

E1 - M3	Support of interactions of SSCT with other SSs and ANFs	ECMA-300 ISO/IEC 19460			A2: m
A5	Behaviour as Interrupting PINX for Call Priority Interruption (CPI)	ECMA-264 ISO/IEC 15992	o	o	C2: o
E1 - L3	Support of interactions of CPI with other SSs and ANFs	ECMA-264 ISO/IEC 15992			A5: m

A.3.4 Keypad and Feature key Procedures

Item	Question/Feature	Reference	Protocol Status	Profile Status attached PINX	Profile Status virtual transit PINX
	Support of Keypad Procedures as specified for the S and S/T reference point		o	x	x
	Support of Feature key Procedures as specified for the S and S/T reference point		o	x	x