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**Zasebno omrežje z integriranimi storitvami (PISN) - Standard profila za uporabo PSS1 (QSIG) v omrežjih s storitvami radijskega prometa**

Private Integrated Services Network (PISN); Profile Standard for the use of PSS1 (QSIG) in Air Traffic Services networks

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# ETSI EN 301 846 V1.1.1 (2001-07)

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*European Standard (Telecommunications series)*

## **Private Integrated Services Network (PISN); Profile Standard for the use of PSS1 (QSIG) in Air Traffic Services networks**

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## Foreword

This European Standard (Telecommunications series) has been produced by ECMA on behalf of its members and those of the European Telecommunications Standards Institute (ETSI).

The present document 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.

The present document specifies the functional profile for interconnecting Private Integrated services Network eXchanges (PINX) in Air Traffic Services (ATS) PISNs to permit interoperability between equipment from different vendors.

It results from a mandate (M/239) from the Commission of the European Community (CEC) for standardization in the field of air traffic management equipment and systems.

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**National transposition dates**

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| Date of adoption of this EN:   | 27 July 2001    |
| Date of latest announcement of this EN (doa):  | 31 October 2001 |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 30 April 2002   |
| Date of withdrawal of any conflicting National Standard (dow):                         | 30 April 2002   |



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# 1 Scope

The present document 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 between Private Integrated services Networks eXchange (PINX) in an Air Traffic Services (ATS) PISN.

The present document defines:

- physical and electrical characteristics (physical layer) of the interfaces to the transmission systems to be employed;
- data link layer procedures to ensure error-free communications links;
- network layer procedures for call establishment and clearing; and
- supplementary services to meet specific ATS requirements.

The present document states requirements upon implementations in order to achieve interoperability between equipment in ATS PISNs.

NOTE 1: Implementation of the present document does not preclude a manufacturer from offering other means of interconnection.

The present document does not specify requirements related to interworking between QSIG and other signalling systems used in ATS PISNs.

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# 2 Conformance (standards.iteh.ai)

A system conforms to the present document if it correctly performs all the mandatory capabilities defined in the Requirement List (RL) (annex A) and the profile specific Implementation Conformance Statement (ICS) (annex B). Note that more capabilities may be mandatory than in the base standards.

---

# 3 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

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

ETSI 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]".

ETSI ETS 300 290 (1994): "Business TeleCommunications (BTC); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Terminal equipment interface".

ETSI ETS 300 290, Amendment 1 (1995): "Business TeleCommunications (BTC); 64 kbit/s digital unrestricted leased line with octet integrity (D64U); Terminal equipment interface".

ETSI ETS 300 402-2 (1995): "Integrated Services Digital Network (ISDN); Digital Subscriber Signalling System No. one (DSS1) protocol; Data link layer; Part 2: General protocol specification [ITU-T Recommendation Q.921 (1993), modified]".

ETSI EN 300 402-4 (V1.2.3): "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".

ETSI EN 300 426: "Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Call intrusion supplementary service [ISO/IEC 14846 (1996), modified]".

ETSI ETS 300 475-1: "Private Telecommunication Network (PTN); Reference configuration; Part 1: Reference configuration for PTN eXchanges (PTNX) [ISO/IEC 11579-1 (1994), modified]".

ETSI EN 301 039: "Private Integrated Services Network (PISN); Mapping functions for the employment of 64 kbit/s circuit mode connections with 16 kbit/s sub-multiplexing".

ETSI EN 301 048: "Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Transit counter additional network feature [ISO/IEC 15056 (1997) modified]".

ETSI EN 301 656: "Private Integrated Services Network (PISN); Inter-exchange signalling protocol; Call priority interruption and call priority interruption protection supplementary services; [ISO/IEC 15992 (1998), modified]".

ISO/IEC 9646-7 (1994): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".

ITU-T Recommendation G.728 (1992): "Coding of speech at 16 kbit/s using low-delay code excited linear prediction".

ITU-T Recommendation T.50 (1992): "Information technology - 7-bit coded character set for information interchange".

ITU-T Recommendation Z.100 (1993): "Specification and description language (SDL)".

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## 4 Definitions

### 4.1 External definitions

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For the purposes of the present document, the terms and definitions given in the following apply:

|   |                 |
|---|-----------------|
| <b>C reference point:</b>                                   | (ETS 300 475-1) |
| <b>Destination PINX:</b>                                    | (ETS 300 239)   |
| <b>End PINX:</b>  | (ETS 300 239)   |
| <b>Gateway PINX:</b>  | (EN 300 172)    |
| <b>Incoming Call:</b>                                       | (EN 300 172)    |
| <b>Inter-PINX Connection:</b>                               | (EN 301 039)    |
| <b>Inter-PINX Link:</b>                                     | (EN 301 039)    |
| <b>Mapping functional group:</b>                            | (ETS 300 475-1) |
| <b>Originating PINX:</b>                                    | (EN 300 172)    |
| <b>Outgoing Call:</b>                                       | (EN 300 172)    |
| <b>Preceding PINX:</b>                                      | (ETS 300 239)   |
| <b>Private Integrated Services Network (PISN):</b>          | (ETS 300 475-1) |
| <b>Private Integrated Services Network Exchange (PINX):</b> | (ETS 300 475-1) |
| <b>Q reference point:</b>                                   | (ETS 300 475-1) |
| <b>Side, Incoming Side and Outgoing Side:</b>               | (EN 300 172)    |

|                           |                 |
|---------------------------|-----------------|
| <b>Source PINX:</b>       | (ETS 300 239)   |
| <b>S reference point:</b> | (ETS 300 475-1) |
| <b>Subsequent PINX:</b>   | (ETS 300 239)   |
| <b>Terminating PINX:</b>  | (EN 300 172)    |
| <b>Transit PINX:</b>      | (EN 300 172)    |

## 5 Abbreviations

For the purposes of the present document, the following abbreviations apply:

|         |   |
|---------|---|
| ACSE    | Association Control Service Element                         |
| AIS     | Alarm Indication Signal                                     |
| ANF     | Additional Network Feature                                  |
| APDU    | Application Protocol Data Unit                              |
| ASN.1   | Abstract Syntax Notation One                                |
| ATS     | Air Traffic Services  |
| CC      | Call Control  |
| CICL    | Call Intrusion Capability Level                             |
| CIPL    | Call Intrusion Protection Level                             |
| CPICL   | Call Priority Interruption Capability Level                 |
| CPIPL   | Call Priority Interruption Protection Level                 |
| DSE     | Dialogue Service Element                                    |
| GFT     | Generic Functional Transport                                |
| HLC     | High Layer Compatibility                                    |
| i       | irrelevant  |
| ICS     | Implementation Conformance Statement                        |
| IPCC    | Inter-PINX Connection Control                               |
| LD-CELP | Low Delay Code Excited Linear Prediction                    |
| LLC     | Low Layer Compatibility                                     |
| m       | mandatory   |
| MP      | MaPping   |
| n/a     | not applicable  |
| NFE     | Network Facilities Extension                                |
| o       | optional  |
| o.i     | optional, qualified   |
| PINX    | Private Integrated services Network eXchange                |
| PISN    | Private Integrated Services Network                         |
| PSS1    | Private Signalling System no. 1                             |
| PTS     | Private Termination System                                  |
| QSIG    | Q reference point SIGnalling system                         |
| RL      | Requirements List   |
| ROSE    | Remote Operations Service Element                           |
| SCA     | Simultaneous Call Attempt                                   |
| SCM     | Signalling Carriage Mechanism                               |
| SS-CI   | Supplementary Service Call Intrusion                        |
| SS-CPI  | Supplementary Service Call Priority Interruption            |
| SS-CPIP | Supplementary Service Call Priority Interruption Protection |
| SW      | SWitching   |
| TE      | Terminal Equipment  |
| TEI     | Terminal Endpoint Identifier                                |
| x       | eXcluded  |

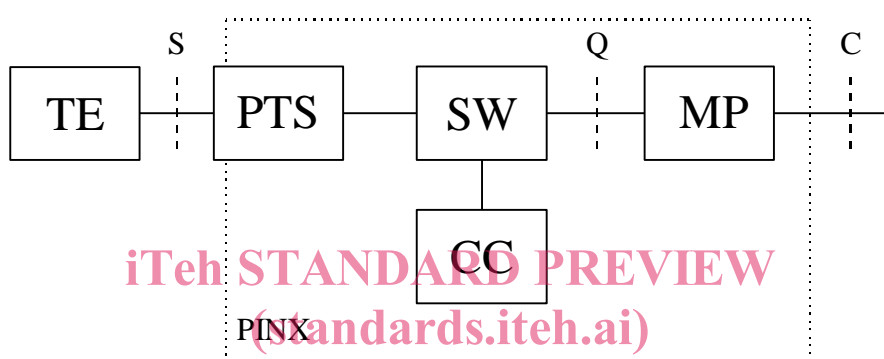
## 6 Specification framework

### 6.1 General

The approach taken in the present document is to define the detailed digital signalling functions within the framework of functional groupings defined in the reference configuration for PISN eXchanges (ETS 300 475-1). This approach abstracts the specification of the functions from any realization as a real piece of equipment. At the same time it provides a complete model of a hypothetical system that can easily be translated to a physical implementation.

NOTE 2: The use of such a framework for describing the required functions need not constrain solutions for providing the functions nor is it intended to imply any particular design architecture. It simply provides a convenient method of specifying the required functions and, later on, the tests to confirm that such functions are supported by a particular piece of equipment.

The major PINX functions and their relationships are illustrated in figure 1; the functions are described in the following clauses.



**Figure 1: Major PINX functions**

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The model in figure 1, and the functionality defined by it, represents a single instance of a service invocation (i.e. a call). A PINX claiming conformance with the present document shall be capable of providing multiple simultaneous instances of the defined functions.

### 6.2 Terminal Equipment (TE)

The TE function provides the necessary means for a human user, by actions at the Human Machine Interface, to initiate outgoing calls to or respond to incoming calls from another TE function. The TE function may be simple (e.g. a simple telephone handset) or complex (e.g. an ATS Controller Working Position).

The detailed requirements of this function are outside the scope of the present document.

### 6.3 Private Termination System (PTS)

The PTS function provides transmission and signalling capabilities between the TE function and the SW function. The PTS function, if necessary, adapts the physical, electrical and procedural conditions of the interface used to attach a TE to the PINX, to the internal conditions of the PINX.

The detailed requirements of this function are outside the scope of the present document.

## 6.4 Switching (SW)

The SW function provides the capability to switch user information and signalling information.

User information is switched between the PTS function and the MP function. Selection of the switching path depends upon the parameters of the service request.

Signalling information is switched between:

- the PTS function and the CC function; and
- between the CC function and the MP function.

NOTE 3: The switching function may also switch both user and signalling information between the described functions and other functions outside the scope of the present document.

The detailed requirements of this function are specified in clause 8.

## 6.5 Mapping (MP)

The MP function provides adaptation of the internal conditions of the PINX to the physical, electrical, and procedural conditions of the interface used to attach the PINX to an external transmission facility (e.g. a leased circuit) for inter-PINX communications.

The MP function also provides the multiplexing functions required to separate or merge the user information and signalling information from the PINX to the transmission facility employed.

The detailed requirements of this function are specified in clause 9.

## 6.6 Call Control (CC)

The CC function provides the functions necessary to control calls between TE functions attached to the ATS PISN. It incorporates all the components of the PSS1 (QSIG) protocol model (i.e. Protocol Control, Call Control, GFT-Control, the Coordination function, and applicable SS-Control entities) described in EN 300 172 and ETS 300 239.

NOTE 4: The CC function also provides the functions necessary to control calls between TE functions attached to the ATS PISN and other subscribers (e.g. connected to the public telecommunications network). It can also provide signalling interworking functions when necessary. However, these aspects are outside the scope of the present document.

NOTE 5: In the present document, requirements applicable to the CC function are specified separately for each of the following cases:

- Outgoing and Incoming sides of a ATS QSIG Call (End PINX case); and
- Interworking between an Incoming side and an Outgoing side (Transit PINX case).

The detailed requirements of this function are specified in clauses 10 and 11.

## 7 Physical interface and protocol stack at the C reference point

Figure 1 also shows, using vertical dashed lines, the "reference points" at which physical interfaces may occur. The present document defines the required behaviour at a physical interface at the C reference point. Figure 2 shows the protocol stack applicable at the C reference point.

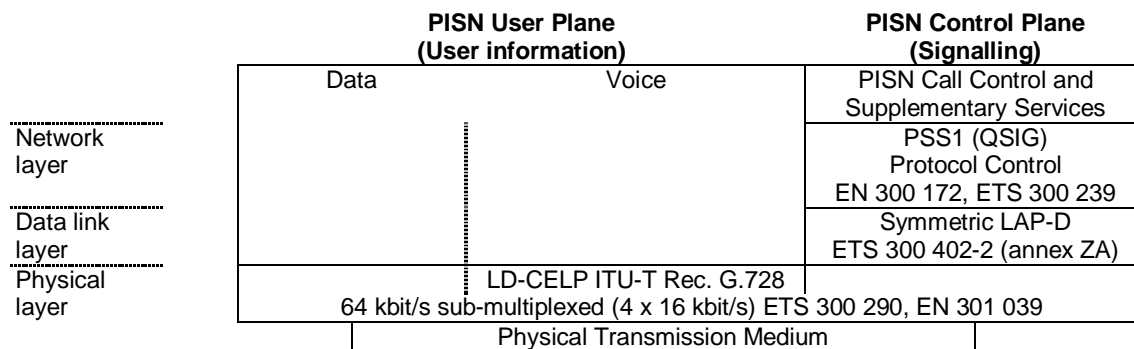


Figure 2: Protocol stack

## 8 Switching (SW) functions

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### 8.1 Speech compression

For 16 kbit/s speech calls in which the PINX acts as the "End PINX", the SW function shall provide a speech compression and decompression capability (CELP codec) according to the requirements of ITU-T Recommendation G.728. Outgoing speech information from the PINX shall be compressed using the encoding algorithm specified in ITU-T Recommendation G.728. Speech information incoming to the PINX shall be decompressed using the decoding algorithm specified in ITU-T Recommendation G.728.

NOTE 6: The CELP codec described in ITU-T Recommendation G.728 contains selectable options to permit operation with modem or other non-speech signals. Such operation is not anticipated in the ATS context.

The bit-stealing method, as specified in ITU-T Recommendation G.728/clause 3.11, shall be used for synchronizing the LD-CELP bitstream. The stolen bits shall be an alternating sequence of zeros and ones (i.e. either 010101... or 101010...).

For calls in which the PINX acts as a "Transit PINX", speech information shall not be decompressed and re-compressed.

## 9 Mapping (MP) functions

### 9.1 Physical layer functions

NOTE 7: The physical interface and sub-multiplexing techniques specified in 9.1.1 have been selected as appropriate for ATS PISNs. The inclusion of other physical interfaces (e.g. at 2 048 kbit/s) in a future edition of the present document is not precluded.

One consequence of this is that the number of channels and their attributes (e.g. information transfer rate, user information layer 1 protocol) at the Q reference point may be different from that presently specified. Such a change implies changes to the requirements to be met by the Mapping function and the Call Control function.

A further consequence is that, when the inter-PINX connection is provided by means of a leased circuit, establishment of the connection is achieved through an administrative procedure with the leased circuit provider. Functions for the control of the connection (i.e. the IPCC functional group, as specified in ETS 300 475-1) are needed only when on-demand connections (e.g. through the public ISDN) are used as the inter-PINX connection.

Suppliers should be aware of these possibilities and may wish to design their solutions accordingly.

#### 9.1.1 Physical and electrical interface requirements

The MP function shall meet the requirements for physical and electrical characteristics specified in ETS 300 290 and its amendment.

#### 9.1.2 Rate adaptation and sub-multiplexing

The MP function shall meet the requirements specified in EN 301 039 for sub-multiplexing a 64 kbit/s circuit-mode inter-PINX connection into 4 x 16 kbit/s channels.

The MP function shall provide a rate adaptation capability. Incoming speech information shall be adapted to the internal channel rate. Outgoing speech information shall be adapted from the internal channel rate to the rate required by the external transmission facility, as specified in EN 301 039.

#### 9.1.3 Alarm Indication Signal (AIS)

If the MP function receives multiple octets (i.e. > 3 octets) containing an all one's bit pattern from the external transmission facility it shall assume this to be an Alarm Indication Signal (AIS). The MP function shall assume the transmission facility and/or the peer PINX is out of service and take appropriate management action.

The MP function shall be capable of sending AIS towards the external transmission facility when it detects loss of bit violations in the received bit stream. On resumption of normal bit violations the MP function shall stop sending AIS.

NOTE 8: There may be other, implementation dependant, circumstances when the MP function is required to send AIS. These are outside the scope of the present document.

#### 9.1.4 Synchronization

Synchronization functions of the MP function shall be compatible with the synchronization strategy of the PINX. That is to say, the MP function shall be capable of both (but not simultaneously):

- extracting the timing received at the receive side of the physical interface and delivering it as an external clock source for the entire system, and synchronizing the MP function's own output timing to this source; and
- synchronizing the MP function's own output timing to another clock source not derived from the physical interface associated with this MP function.

Selection of the option shall be by system configuration and runtime determination.