INTERNATIONAL STANDARD

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Information technology — Telecommunications and information exchange between systems — Broadband Private Integrated Services Network — Service description — Broadband connection oriented bearer services

Technologies de l'information — Télécommunications et échange d'information entre systèmes — Réseaux privés à intégration de services à large bande — Description des services — Services à large bande de supports orientés connexion

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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. 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.

International Standard ISO/IEC 15899 was prepared by ECMA (as ECMA-261) 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.

Annex A is for information only.

Introduction

This International Standard is one of a series of standards defining services and signalling protocols applicable to Broadband Private Integrated Services Networks. The series uses the B-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 broadband connection oriented bearer services.

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 national standardization bodies. It represents a pragmatic and widely based consensus.

The services specified in this International Standard are compatible with the equivalent services specified by the ATM Forum for private ATM networks and by ITU-T or ETSI for public B-ISDN.

Information technology - Telecommunications and information exchange between systems - Broadband Private Integrated Services Network - Service description - Broadband connection oriented bearer services

1 Scope

This International Standard specifies service description and control aspects of the broadband connection oriented bearer services which may be provided by Broadband Private Integrated Services Networks (B-PISNs).

One of the purposes of the service specification for broadband connection oriented bearer services is to guide and constrain the work on signalling protocols. Therefore, this International Standard is concerned mainly with the control aspects of services.

Change of traffic characteristics during a call is outside the scope of this International Standard.

Charging considerations are outside the scope of this International Standard.

2 Conformance

In order to conform to this International Standard, a protocol standard shall specify signalling protocols and equipment behaviour that are capable of being used in a B-PISN which supports the bearer service specified in this International Standard. This means that, to claim conformance, a protocol standard is required to be adequate for the support of those aspects of clause 6 which are relevant to the interface or equipment to which the protocol standard applies.

3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standard.

ISO/IEC 11574:1994,	*Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Circuit-mode 64 kbit/s bearer services - Service description, functional capabilities and information flows.*
ISO/IEC 11579-1:1994,	*Information technology - Telecommunications and information exchange between systems - Private Integrated Services Network - Part 1: Reference configuration for PISN Exchanges (PINX).*
ITU-T Rec. I.112:1993,	*Vocabulary of terms for ISDNs.*
ITU-T Rec. I.113:1993,	*Vocabulary of terms for broadband aspects of 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.361	*B-ISDN ATM layer specification.*
ITU-T Rec. I.363	*B-ISDN ATM adaptation layer (AAL) specification.*
ATM Forum	*User Network Interface Specification, Version 4.0 (UNI 4.0).*
ATM Forum	*Traffic Management Specification, Version 4.0 (TM 4.0).*

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:

- Basic service (ITU-T Rec. I.210)
- Connection (ITU-T Rec. I.113)
- Private Integrated Services Network (PISN) (ISO/IEC 11579-1)

– Private Integrated Services Network Exchange (PINX) (ISO/IEC 11579-1)
– Service (ITU-T Rec. I.112)
– Signalling (ITU-T Rec. I.112)
– Supplementary Service (ITU-T Rec. I.210)
– Traffic contract (ITU-T Rec. I.113)
– User (ISO/IEC 11574)
– Virtual channel (ITU-T Rec. I.113)

4.2 Call : An association between two or more users using a telecommunication service to communicate through one or more networks.

4.3 Call/connection : A call combined with a single connection in the user plane for the transfer of user information.

5 List of acronyms

AAL	ATM Adaptation Layer
ABR	Available Bit Rate
ATM	Asynchronous Transfer Mode
B-PISN	Broadband Private Integrated Services Network
BCOB	Broadband Connection Oriented Bearer
CBR	Constant Bit Rate
CDV	Cell Delay Variation
CLP	Cell Loss Priority
CLR	Cell Loss Ratio
ISDN	Integrated Services Digital Network
MBS	Maximum Burst Size
MCR	Minimum Cell Rate
OAM	Operation And Maintenance
PCR	Peak Cell Rate
PINX	Private Integrated Services Network Exchange
PISN	Private Integrated Services Network
QoS	Quality of Service
SCR	Sustainable Cell Rate
UBR	Unspecified Bit Rate
VBR	Variable Bit Rate

6 Broadband connection oriented bearer services

6.1 Description

These bearer services allow PISN users to request on a demand basis unrestricted digital information transfer with constant or variable bit rate between PISN users and to negotiate a suitable traffic contract with the PISN.

On the basis of the negotiated traffic contract, PISN users can communicate in point to point or point to multipoint configurations via the PISN using ATM virtual channel connections. Once a virtual channel connection has been established according to the procedures described in 6.3, it is available for the transmission of digital signals either in one direction or in both directions simultaneously, within the limits of the traffic contract, for the duration of the call/connection. The PISN shall place no restrictions on the content of the digital signals but may apply traffic and congestion control in order to prevent violation of the negotiated traffic contract.

6.2 Static Description: Service Attributes

The valid combinations of service attributes for all bearer services specified here are those defined in annex 9 of the ATM Forum specification UNI 4.0. The ATM service categories are defined in the ATM Forum specification TM 4.0.

6.2.1 Bearer service using a constant bit rate

6.2.1.1 Dominant information transfer attributes

The dominant information transfer attribute values for this service shall be:

1) Information transfer mode: ATM

1.1) Connection mode: Connection oriented

1.2) ATM service category: Constant Bit Rate (CBR)

1.3) Allowable bearer classes: BCOB-A, BCOB-X

2) Information transfer rate: Specified individually for each direction of transmission

2.1) Peak cell rate: PCR(CLP=0+1) declared by the user on a per connection basis
PCR(CLP=0) optionally declared separately
PCR(OAM) optionally declared separately

2.2) Sustainable cell rate / maximum burst size: not applicable

2.3) Tagging: Not allowed, or optionally allowed if PCR(CLP=0) is given

2.4) Frame discard: Either allowed or not allowed

3) Information transfer capability: Unrestricted

4) Structure: Cell sequence integrity.

6.2.1.2 Secondary information transfer attributes

The secondary information transfer attribute values for this service category shall be:

5) Establishment of communication: Demand; reserved and permanent outside the scope of this International Standard

6) Symmetry: Bidirectional symmetric, bidirectional asymmetric, unidirectional

7) Communication configuration: Point-to-point; point to multi-point

6.2.1.3 Access attributes

The access attribute values for this service category shall be:

8) Access channel: ATM virtual channel

9) Access protocol: ATM layer: I.361
ATM Adaptation Layer (AAL): I.363
Higher layers: Application specific

6.2.1.4 General attributes

10) Supplementary services provided: Outside the scope of this International Standard

11) Quality of service: QoS class 0; other classes network specific

11.1) Maximum end-to-end transit delay: Optionally specified (for forward direction).

11.2) Cell loss ratio: Optionally either CLR(CLP=0+1) or CLR(CLP=0) specified

11.3) Cell delay variation: Optionally peak-to-peak CDV specified

12) Interworking possibilities: 64 kbit/s and n x 64 kbit/s circuit mode basic services

6.2.2 Bearer service with real time requirements using a variable bit rate

6.2.2.1 Dominant information transfer attributes

The dominant information transfer attribute values for this service shall be:

1) Information transfer mode: ATM

1.1) Connection mode: Connection oriented

1.2) ATM service category: Real Time Variable Bit Rate (rt-VBR)

1.3) Allowable bearer classes: BCOB-C, BCOB-X

2) Information transfer rate: Specified individually for each direction of transmission

2.1) Peak cell rate: PCR(CLP=0+1) declared by the user on a per connection basis

2.2) Sustainable cell rate: Either SCR(CLP=0+1) or SCR(CLP=0) declared by the user on a per connection basis

2.3) Maximum burst size: Either MBS(CLP=0+1) or MBS(CLP=0) declared by the user on a per connection basis

2.4) Tagging: If SCR(CLP=0) is given, either allowed or not allowed

2.5) Frame discard: Either allowed or not allowed

3) Information transfer capability: Unrestricted

4) Structure: Cell sequence integrity.

6.2.2.2 Secondary information transfer attributes

The secondary information transfer attribute values for this service category shall be:

5) Establishment of communication: Demand; reserved and permanent outside the scope of this International Standard

6) Symmetry: Bidirectional symmetric, bidirectional asymmetric, unidirectional

7) Communication configuration: Point-to-point; point to multi-point

6.2.2.3 Access attributes

The access attribute values for this service category shall be:

8) Access channel: ATM virtual channel

9) Access protocol: ATM layer: I.361
ATM Adaptation Layer (AAL): I.363
Higher layers: Application specific

6.2.2.4 General attributes

10) Supplementary services provided: Outside the scope of this International Standard

11) Quality of service: QoS class 0; other classes network specific

11.1) Maximum end-to-end transit delay: Optionally specified (for forward direction).

11.2) Cell loss ratio: Optionally either CLR(CLP=0+1) or CLR(CLP=0) specified

11.3) Cell delay variation: Optionally peak-to-peak CDV specified

12) Interworking possibilities: Application specific

6.2.3 Bearer service without real time requirements using a variable bit rate

6.2.3.1 Dominant information transfer attributes

The dominant information transfer attribute values for this service shall be:

1) Information transfer mode: ATM

1.1) Connection mode: Connection oriented

1.2) ATM service category: Non-real Time Variable Bit Rate (nrt-VBR)

1.3) Allowable bearer classes: BCOB-C, BCOB-X

2) Information transfer rate: Specified individually for each direction of transmission

2.1) Peak cell rate: PCR(CLP=0+1) declared by the user on a per connection basis

2.2) Sustainable cell rate: Either SCR(CLP=0+1) or SCR(CLP=0) declared by the user on a per connection basis

2.3) Maximum burst size: Either MBS(CLP=0+1) or MBS(CLP=0) declared by the user on a per connection basis

2.4) Tagging: If SCR(CLP=0) is given, either allowed or not allowed

2.5) Frame discard: Either allowed or not allowed

3) Information transfer capability: Unrestricted

4) Structure: Cell sequence integrity.

6.2.3.2 Secondary information transfer attributes

The secondary information transfer attribute values for this service category shall be:

5) Establishment of communication: Demand; reserved and permanent outside the scope of this International Standard

6) Symmetry: Bidirectional symmetric, bidirectional asymmetric, unidirectional

7) Communication configuration: Point-to-point; point to multi-point

6.2.3.3 Access attributes

The access attribute values for this service category shall be:

8) Access channel: ATM virtual channel

9) Access protocol: ATM layer: I.361
ATM Adaptation Layer (AAL): I.363
Higher layers: Application specific

6.2.3.4 General attributes

10) Supplementary services provided: Outside the scope of this International Standard

11) Quality of service: QoS class 0; other classes network specific

11.1) Cell loss ratio: Optionally either CLR(CLP=0+1) or CLR(CLP=0) specified

11.2) Cell delay variation: Unspecified

12) Interworking possibilities: Application specific

6.2.4 Bearer service using the available bit rate

6.2.4.1 Dominant information transfer attributes

The dominant information transfer attribute values for this service shall be:

1) Information transfer mode: ATM

1.1) Connection mode: Connection oriented

1.2) ATM service category: Available Bit Rate (ABR)

1.3) Allowable bearer classes: BCOB-C, BCOB-X

2) Information transfer rate: Specified individually for each direction of transmission

2.1) Peak cell rate: PCR(CLP=0+1) declared by the user on a per connection basis

2.2) Sustainable cell rate / Maximum burst size: not applicable

2.3) ABR minimum cell rate: ABR MCR declared on a per connection basis

2.4) Tagging: Not allowed

2.5) Frame discard: Either allowed or not allowed

3) Information transfer capability: Unrestricted

4) Structure: Cell sequence integrity.

6.2.4.2 Secondary information transfer attributes

The secondary information transfer attribute values for this service category shall be:

5) Establishment of communication: Demand; reserved and permanent outside the scope of this International Standard

6) Symmetry: Bidirectional symmetric, bidirectional asymmetric, unidirectional

7) Communication configuration: Point-to-point; point to multi-point

6.2.4.3 Access attributes

The access attribute values for this service category shall be:

8) Access channel: ATM virtual channel

9) Access protocol: ATM layer: I.361
ATM Adaptation Layer (AAL): I.363
Higher layers: Application specific

6.2.4.4 General attributes

10) Supplementary services provided: Outside the scope of this International Standard

11) Quality of service: QoS class 0

12) Interworking possibilities: Application specific

6.2.5 Bearer service using the unspecified bit rate

6.2.5.1 Dominant information transfer attributes

The dominant information transfer attribute values for this service shall be:

1) Information transfer mode: ATM

1.1) Connection mode: Connection oriented

1.2) ATM service category: Unspecified Bit Rate (UBR)

1.3) Allowable bearer classes: BCOB-C, BCOB-X

2) Information transfer rate: Specified individually for each direction of transmission

2.1) Peak cell rate: PCR(CLP=0+1) declared by the user on a per connection basis

2.2) Sustainable cell rate / maximum burst size: not applicable

2.3) Best effort indication: Specified

2.4) Tagging: Either allowed or not allowed

2.5) Frame discard: Either allowed or not allowed

3) Information transfer capability: Unrestricted

4) Structure: Cell sequence integrity.

6.2.5.2 Secondary information transfer attributes

The secondary information transfer attribute values for this service category shall be:

5) Establishment of communication: Demand; reserved and permanent outside the scope of this International Standard

6) Symmetry: Bidirectional symmetric, bidirectional asymmetric, unidirectional

7) Communication configuration: Point-to-point; point to multi-point

6.2.5.3 Access attributes

The access attribute values for this service category shall be:

8) Access channel: ATM virtual channel

9) Access protocol: ATM layer: I.361

ATM Adaptation Layer (AAL): I.363

Higher layers: Application specific

6.2.5.4 General attributes

10) Supplementary services provided: Outside the scope of this International Standard

11) Quality of service: QoS class 0

12) Interworking possibilities: Application specific

6.3 Procedures

6.3.1 Provision

One or more of the broadband connection oriented bearer services shall be provided.

6.3.2 Normal procedures

6.3.2.1 Call/connection establishment at the calling user

The call/connection is originated by the PISN user requesting this service. With the request the originating user shall supply the destination number identifying the called PISN user and the source traffic description which shall be used by the PISN to reserve a suitable virtual channel for the call/connection. Other information as required, e.g. originating number, may also be included.

A virtual channel identifier shall be assigned between calling user and PISN, which shall remain in use throughout the lifetime of the call/connection. This identifier is of significance only between the calling user and the first virtual channel switching point on the route towards the called user.

After initiating the call/connection the calling user shall get an indication that the PISN is proceeding with the call/connection request, an indication when the called user has been informed of the call/connection and an indication when the connection has been established.

6.3.2.2 Call/connection establishment at the called user

If sufficient resources for the call/connection are available, a virtual channel shall be reserved and the called user shall be informed of the arrival of the call/connection, including the relevant traffic description. If the called user is capable of receiving the call/connection this shall be indicated to the PISN. The PISN shall then complete the call/connection establishment and inform the calling user.

A virtual channel identifier shall be assigned between the PISN and the called user, which shall remain in use throughout the lifetime of the call/connection. This identifier is of significance only between the final virtual channel switching point in the PISN and the called user.

6.3.2.3 Active call/connection

Once the call/connection has been established between calling and called user, the users can use the allocated virtual channel connection to exchange user information within the limits of the agreed traffic contract.

6.3.2.4 Terminating the call/connection

A call/connection may be terminated by either user by sending a release request. The PISN shall acknowledge the request, inform the other user of the termination, and release all resources allocated to the call/connection.

6.3.3 Exceptional procedures

6.3.3.1 Call/connection establishment

The exceptional procedures handle the following conditions:

a) Failure situations due to user error

A user sending an invalid service request or an invalid PISN number shall be given an appropriate failure indication, and call/connection establishment shall be ceased.

b) Failure situations due to called user state

The calling user shall be given an appropriate failure indication and call/connection establishment shall be aborted in the following situations:

- The called user is busy or insufficient resources are available at the called user's access.
- The called user's terminal equipment is not compatible with the required traffic characteristics.
- The called user's terminal equipment fails to respond within a defined period.
- The called user fails to answer the call/connection request within a defined period.
- The called user rejects the call/connection request.

c) Failure situations due to network conditions

If the PISN cannot meet the required traffic characteristics, e.g. in the case of congestion, the calling user shall be given an appropriate failure indication, and call/connection establishment shall be ceased.

6.3.3.2 Active call/connection

If the agreed traffic contract is violated the PISN may discard any data which violate the traffic contract without informing the involved users.

6.4 Interworking considerations

6.4.1 Interworking with a public B-ISDN

For each broadband connection oriented bearer service the PISN is able to interwork with the same service in a public B-ISDN, if provided. The interworking function for user information transfer is null.

6.4.2 Interworking with a narrowband private integrated services network (N-PISN)

The 64 kbit/s based circuit mode basic services offered by an N-PISN (including n x 64 kbit/s) can be interworked with the equivalent broadband connection oriented bearer service based on a constant bit rate.

Annex A

(informative)

Glossary of terms

Bearer class BCOB-A: Class A service is a connection-oriented, constant bit rate ATM transport service. Class A service has end-to-end timing requirements and may require stringent cell loss, cell delay and cell delay variation performance.

Bearer class BCOB-C: Class C service is a connection-oriented variable bit rate (see Note) ATM transport service. Class C service has no end-to-end timing requirements.

Note - For Bearer Class C, the network may allocate resources, as if Bearer Class A was requested.

Bearer class BCOB-X: Class X service is a connection-oriented ATM transport service where the AAL, traffic type (e.g. VBR or CBR) and timing requirements are user defined (i.e. transparent to the network).

Cell delay variation: Quality of service parameter which indicates how much cell delays vary on a given ATM connection.

Cell Loss Priority: A single bit in the ATM cell header allows distinction between two priority levels in case cells have to be discarded in overload situations: Cells with the bit set will be discarded before any cells with the bit not set. The notation "CLP=1" or "CLP=0" is used to designate the cell stream of cells with the CLP bit set or not set, respectively. "CLP=0+1" designates the aggregate cell stream irrespective of the CLP bit value.

Cell loss ratio: The number of lost cells relative to the total number of cells submitted to the network.

Frame discard: Indicates that in the case that a cell has to be discarded subsequent cells of the same frame (i.e. AAL protocol data unit) can also be discarded.

Maximum burst size: For variable bit rate, the maximum number of cells that a source may submit "in a burst" (i.e. by sending at the peak cell rate during a short time).

Minimum cell rate: For the available bit rate (ABR) service, the cell rate at which a source is always allowed to send (may be specified as zero). The bandwidth for ABR can vary between minimum and peak cell rate.

Peak cell rate: An upper bound on the rate at which cells can be submitted on an ATM connection, i.e. the maximum cell rate which the source may never exceed.

Sustainable cell rate: For variable bit rate services, an upper bound for the average rate of the cell stream on an ATM connection (measured over time scales which are long relative to those for which the peak cell rate is defined).

Tagging: Means changing the CLP bit from 0 to 1 for a cell which is identified as non-conforming to the CLP=0 cell stream but conforming to the CLP=0+1 cell stream. (see Cell Loss Priority above). Tagging is a network and a user option. If provided, a user may select tagging when establishing a connection, thus giving the network permission to "tag" cells when necessary.

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