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Foreword

This part of European Telecommunication Standard (ETS) 300 217 has been prepared by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI).

According to CCITT Recommendation I.130, the following three level structure is used to describe the characterisation of telecommunication services:

- Stage 1: is an overall service description, from the user's standpoint;

- Stage 2: identifies the functional capabilities and information flows needed to support the service described in stage 1;

- Stage 3: defines the signalling system protocols and switching functions needed to implement the service described in stage 1.

This ETS details the stage 1 aspects for the Connectionless Broadband Data Service (CBDS).

This part constitutes Part 2 of the 4 part ETS on the CBDS, and defines the basic bearer service.

A list of informative references is given in Annex B.

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1 Scope

This part of European Telecommunication Standard (ETS) 300 217 on the Connectionless Broadband Data Service (CBDS), describes the stage 1 of the switched bearer service provided via Metropolitan Area Networks (MANs) and/or an Asynchronous Transfer Mode (ATM) based network. It is applicable to both the public and private environment whereas special attention is paid to the requirements of the public operators.

This bearer service category provides a means by which Protocol Data Units (PDUs) of variable, but limited length, are delimited and transparently transferred across one source interface to one or more destination interface(s) at the T reference point, without establishing or later releasing a connection between source and destination.

Charging principles are outside the scope of this ETS.

Whilst this bearer service category is aiming primarily at Local Area Network (LAN) interconnections, other uses are envisaged.

2 Normative references

This ETS incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1] CCITT Recommendation E.164 (1991): "Numbering plan for the ISDN era".

[2] ISO/IEC 8802-3 (1990): "Information processing systems - Local area networks - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) - access method and physical layer specifications".

[3] ISO/IEC 8802-5 (1991): "Information processing systems - Local area networks - Part 5: Token ring access method and physical layer specifications".

[4] IEEE 802.6 (1990): "Distributed Queue Dual Bus (DQDB) subnetwork of a metropolitan area network (MAN)".

[5] CCITT Recommendation I.140 (1988): "Attribute technique for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[6] ETS 300 217-1 (1992): "Network Aspects (NA); Connectionless Broadband Data Service (CBDS) Part 1: Overview".

[7] ISO 9314: "Fiber Distributed Data Interface (FDDI)".

3 Definitions and abbreviations

3.1 Definitions

The definitions used in this ETS are given in Part 1, subclause 3.1 of this ETS, ETS 300 217-1 [6].

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

AAL	ATM Adaptation Layer
ATM	Asynchronous Transfer Mode
CBDS	Connectionless Broadband Data Service
CCITT	International Telegraph and Telephone Consultative Committee
DQDB	Distributed Queue Dual Bus
HDLC	High level Data Link Control
LAN	Local Area Network
LAPB	Link Access Procedure Balanced
LAPD	Link Access Procedure on the D-channel
LLC	Logical Link Control
MAC	Media Access Control
MAN	Metropolitan Area Network
MIR	Maximum Information Rate
PDU	Protocol Data Unit
PLCP	Physical Layer Convergence Procedure
QOS	Quality of Service
SIR	Sustained Information Rate
T	T reference point
UMI	User MAN Interface
UNI	User Network Interface
USI	User Specific Interface

4 Description

This bearer service category can be provided by any network but can more suitably be provided by MANs and ATM-based networks. It primarily aims at interconnecting LANs and/or terminals over metropolitan or wide areas.

The service can be provided by making use of different interfaces (User Specific Interface (USI), User MAN Interface (UMI) or User Network Interface (UNI)).

Associated with this bearer service category are Quality of Service (QOS) parameters. Parameter values for which options are explicitly mentioned may be negotiated between parties in the subscriber and service provider domains respectively.

The service may be provided by direct access via high-speed end systems or by means of bridges or routers using the connectionless service mode.

For the UMI and UNI interfaces each user can be addressed by at least one CCITT Recommendation E.164 [1] number. When publicly administered, one USI is identified by only one CCITT Recommendation E.164 [1] number.

5 Procedures

5.1 Provision and withdrawal

The provision of the service shall be by pre-arrangement with the service provider.

The service provider may not provide either all service options and supplementary services listed in this ETS or the full range of features in a particular option e.g. available access classes. This ETS is a compendium list and specific options shall be defined on subscription.

The bearer service is offered with several subscription options which apply separately to each interface at the T reference point.

5.1.1 Subscriber options

The subscriber can choose different subscriber options. For each subscriber option one value can be selected.

The provision of any specific subscriber options and related values within those defined in this subclause depends on the choice of the service provider.

5.1.1.1 Access rate

The service can be provided making use of different interfaces, i.e. the USI, UMI or the UNI. Different access rates are foreseen for the UMI:

- 2,048 Mbit/s;
- 34,368 Mbit/s;
- 139,264 Mbit/s;
- 155,520 Mbit/s.

The following access rates are foreseen for the UNI:

- 155,520 Mbit/s;
- 622,080 Mbit/s.

Further access rates may be considered according to ETSI or CCITT standardisation.

The following access rates are foreseen for the USI:

- 4 Mbit/s;
- 10 Mbit/s;
- 16 Mbit/s;
- 100 Mbit/s.

5.1.1.2 Access classes

The access class defines the information transfer capacity the subscriber subscribes to, in terms of maximum allowed Sustained Information Rate (SIR) across the interface at the T reference point.

Upon subscription the subscriber can choose between different sending access classes. This depends on the access rate and the protocols (see table 1).

Table 1: Values of maximum allowed SIR for different access classes

Access class	SIR (Mbit/s)
A	1,473
B	4*
C	10*
D	16*
E	25,201
F	103,605
G	123,629
H	155*
I	100*

* : Nominal value. The exact values are for further study.

In the basic bearer service the receiving access class cannot be chosen. It is equal to the Maximum Information Rate (MIR) allowed by the access rate and protocol chosen (see tables 5 and 6 in subclauses 9.2.1.1 and 9.2.1.2).

If there are other services provided on the same access link, this shall reduce the MIR for sending and receiving access classes available at the UMI and UNI for the connectionless service on the access.

5.1.1.3 PDU interleaving

Upon subscription, the subscriber can choose between different values for the number of PDUs which may be in transit concurrently across the interface at the T reference point. This applies to the send and receive direction of the network (see table 2).

PDU interleaving is supported only across the UMI/UNI. The current set of protocols supported by the USI do not allow for PDU interleaving.

Table 2: Choices for the maximum number of PDUs sent or received concurrently

Subscription option	Values
max number of PDUs sent concurrently to the network	- 1 - 16 - 128
max number of PDUs sent concurrently from the network	- 1 - 16 - 128

5.1.1.4 Protocols

The service can be accessed by different protocols via the appropriate interface:

Table 3: Access facilities and protocols for the CBDS

Network facility	Protocol	Interface
MAN Access facility 1	IEEE Standard 802.6 [4]	UMI
MAN Access facility 2a	ISO/IEC 8802-3 [2] ISO/IEC 8802-5 [3] ISO 9314 [7] others: for further study	USI
MAN Access facility 2b	IEEE 802.6 [4]	UMI
ATM access network	Physical, ATM and ATM Adaption (type 4) layers (NOTE)	UNI
NOTE: The definition of a higher layer is necessary to provide this service considering the current ATM Adaptation Layer (AAL) type 4 definition.		

5.2 Normal procedures

The user sends data without establishing, releasing or maintaining an end-to-end connection. All information which is required to route the data from the source to the destination is contained in the PDU.

In case of source address validation failure the PDU is discarded.

5.3 Exceptional procedures

For further study.

6 Network capabilities for charging

It shall be possible to charge the subscriber for this service.

7 Interworking requirements

Only interworking with other connectionless services shall be considered.

8 Interaction with supplementary services

The supplementary service description identifies the applicability to this bearer service category, where appropriate. Concerning this bearer service category, the supplementary services associated are described in Part 3 of this ETS.

9 Static description of the service using attributes

The attributes are defined in CCITT Recommendation I.140 [5].

9.1 Information transfer attributes

The values of the information transfer attributes are summarised in table 4.

9.1.1 Information transfer mode

The mode of transfer shall be PDU-based, i.e. a PDU contains the payload and all the information necessary for the network to perform the transfer according to the requirements of the user (e.g. destination address, source address).

9.1.2 Connection mode

The mode of connection shall be connectionless, i.e. each PDU received by the network across one interface at the T reference point is transferred to the destination interface at the T reference point, independently of the previous one; no exchange of signalling information across the originating interface and the destination interface at the T reference point is required prior to the transfer.

9.1.3 Information transfer rate

The value for this attribute is variable bit rate. The SIR shall be less than or equal to the access class. This may be checked by applying the mechanism as described in Annex A, Clause A.1 for the UMI. The equivalent mechanism for the UNI is for further study.

9.1.4 Information transfer capability

The network shall be transparent to the content of the payload of the PDU to be transferred from one interface at the T reference point to another. The service shall be unrestricted.

NOTE: It is left for further standardisation whether or not all the remaining fields of the PDU have to be transferred transparently. This relates specifically to interconnection of MANs via other networks and group addressing.

9.1.5 Structure

The network shall deliver the PDU to the destination interface at the T reference point preserving its structural integrity.

9.1.6 Establishment of communication

The service shall be available after having established the capability of sending and receiving PDUs by negotiation with the service provider. The capability may be established permanently, on reservation or on demand basis.

NOTE: The protocol elements to provide an on demand basis communication establishment are for further study and are restricted to UMI/UNI.

9.1.7 Symmetry

The service shall be unidirectional. A user may send and receive information but when the service is invoked by the user, it allows only for the transfer of information across the originating interface at the T reference point towards the destination interface at the T reference point. Thus a bidirectional transfer of information may be obtained only if the two involved users invoke the service.

9.1.8 Communication configuration

The communication may be point-to-point or point-to-multipoint.

Table 4: Attributes and values of the CBDS

Attributes	Values
Information transfer mode	Protocol Data Units (see definition). (see NOTE)
Connection mode	Connectionless.
Information transfer rate	The SIR shall be less than or equal to the access class. Variable bit rate.
Information transfer capability	Unrestricted.
Structure	PDU integrity.
Symmetry	Unidirectional.
Communication establishment	On demand, reserved, permanent.
Communication configuration	Point-to-point. Point-to-multipoint.
NOTE: For the ATM-based network, this implies that PDU switching is performed in the connectionless service function and not in the ATM switch capability.	

9.2 Access attributes

9.2.1 Access rate and MIR

Several interfaces are foreseen at the T reference point, namely the UMI, UNI and USI. Access attributes to these interfaces are:

- the bit rate used for transmission ("access rate"); and
- the MIR available to the user.

The values of these access attributes are given in subclauses 9.2.1.1 and 9.2.1.2.

9.2.1.1 Values for the UMI and UNI interfaces

The MIR is calculated under the assumption of maximum payload length (i.e. 9 188 octets for the UMI) and maximum header extension of the PDU.

Table 5: Access rate and MIR for UMI/UNI interfaces

Interfaces	Access rate (Mbit/s)	MIR (Mbit/s)
UMI	2,048	1,473
	34,368	25,201
	139,264	103,605
	155,520	123,629
UNI	155,520	for further study
	622,080	for further study
NOTE: If there are other services provided on the same access link, this shall reduce the MIR for sending and receiving access classes available for the connectionless service on the access.		

9.2.1.2 Values for the USI interface

Table 6: Access rate and MIR for the USI interface

Interfaces	Access rate (Mbit/s)	MIR (Mbit/s)
USI	4	for further study
	10	for further study
	16	for further study
	100	for further study
	Others are for further study	for further study

9.2.2 Access classes

The access class defines the information transfer capacity that the subscriber subscribes to, in terms of maximum allowed SIR across the interface at the T reference point.

Two access classes shall be assigned to each interface located at the T reference point: a sending access class for traffic sent from the user to the public network, and a receiving access class for traffic sent from the public network to the user.

The access class is chosen upon subscription.

9.2.2.1 Access classes for the UMI and UNI interfaces

For the UMI interface access classes A through G and I may be chosen and for the UNI interface access classes A through I (see subclause 5.1.1.2).

To ensure that the maximum allowed SIR specified for every access class is not exceeded, a policing function called access class mechanism, is defined.

The access class mechanism is only defined for traffic sent from the user side to the public network. There is no access class mechanism defined for traffic sent from the public network to the user side.

The implementation of the access class mechanism depends on the protocols used. The mechanism is described in Annex A.

NOTE: The transfer of a number of PDUs from a user with high rate access class to one of a lower rate can cause service provision degradation. The definitions of the service options available are for further study.

9.2.2.2 Access classes for the USI interface

Access class B shall be applied to ISO/IEC 8802-5 [3] (4 Mbit/s), access class C to ISO/IEC 8802-3 [2] and access class D to ISO/IEC 8802-5 [3] (16 Mbit/s) and access class I to ISO 9314 [7] (FDDI) (see subclause 5.1.1.2).

9.2.3 PDU interleaving

9.2.3.1 PDU interleaving across the UMI/UNI

For the maximum number of PDUs that may be transferred concurrently across the T reference point from the network to the user, three choices, to be determined upon subscription, should be available:

1) only one PDU may be in transit. The network shall buffer up to 15 PDUs when this value is exceeded;

2) up to 16 PDUs may be in transit concurrently. The network may attempt to buffer PDUs when this value is exceeded; this is a network option;

3) up to 128 PDUs may be in transit concurrently. The network may attempt to buffer PDUs when this value is exceeded; this is a network option.

For the maximum number of PDUs that may be transferred concurrently across the T reference point from the user to the network, three choices, to be determined upon subscription, should be available:

a) only one PDU may be in transit. The network is allowed to not deliver any data sent in excess of this value;

b) up to 16 PDUs may be in transit concurrently. Up to this value the network must meet the stated QOS criteria. The network is allowed to not deliver any data sent in excess of this value;

c) up to 128 PDUs may be in transit concurrently. Up to this value the network must meet the stated QOS criteria. The network is allowed to not deliver any data sent in excess of this value.

9.2.3.2 PDU interleaving across the USI

The current set of protocols supported by the USI do not allow for PDU interleaving.

9.3 General attributes

9.3.1 Supplementary services provided

Supplementary services are described in Part 3 of this ETS.

9.3.2 Quality of service

For a given service, QOS is a statement of the performance of the service as offered or specified to the customer. It is defined and measured in terms of parameters which are stated in a language understandable by the customer and appropriate to the particular service concerned, and which can be verified by the customer. These parameters depend upon the point at which the customers access the service.

The QOS parameter values are defined in table 7 for the UMI and UNI interfaces and in table 8 for the USI interface (see DTR/NA-53202).

Table 7: QOS requirements for UMI/UNI

QOS parameter	Value	NOTES
Service availability	for further study	
Lost PDU ratio	for further study	The stated value applies to a payload size of up to 9 188 octets.
Duplicated PDU ratio	for further study	
Misdelivered PDU ratio	for further study	
Undetected Error ratio	for further study	
Missequenced PDU ratio	for further study	
Transit delay		Transit delay for an individual PDU may be greatly increased if local interface flow control is exercised at either the transmitting or the receiving side. Occurrences of local interface flow control initiated by the user are excluded in calculating transit delay values.
- individually addressed PDUs	for further study	The stated value applies to a payload size of up to 9 188 octets.
- group addressed PDUs	for further study	

Table 8: QOS requirements for USI

QOS parameter	Value	NOTES
Service availability	for further study	
Lost PDU ratio	for further study	
Duplicated PDU ratio	for further study	
Misdelivered PDU ratio	for further study	
Undetected Error ratio	for further study	
Missequenced PDU ratio	for further study	
Transit delay		Transit delay for an individual PDU may be greatly increased if local interface flow control is exercised at either the transmitting or the receiving side. Occurrences of local interface flow control initiated by the user are excluded in calculating transit delay values.
- individually addressed PDUs	for further study	
- group addressed PDUs	for further study	

9.3.3 Payload length

The service allows the transmission and reception of PDUs containing any number of octets up to a maximum value. This maximum length of the payload depends on a class.

Table 9: Payload length class

Payload length class	Maximum payload length (octets)
1	9 188
2	9 159
3	4 979
4	4 472
5	1 500

Table 10: Allocation of payload length class to the interface/protocol

Interface/protocol	Payload length class
UMI/UNI	1, others for further study
USI	
- ISO/IEC 8802-3 [2]	5
- ISO/IEC 8802-5 (4 Mbit/s) [3]	3
- ISO/IEC 8802-5 (16 Mbit/s) [3]	2
- ISO 9314 (FDDI) [7]	4

9.3.4 Interworking possibilities

Only interworking with other connectionless services shall be considered.

9.3.5 Operational and commercial

None identified.

Annex A (normative): Access class mechanisms

A.1 Access class mechanism for UMI

The mechanism is based on a "credit manager", a counter that is incremented at constant speed all the time, and decremented when data is sent.

When a PDU enters the network, the value of the counter shall be compared to the size (the length of the information field, measured in octets) of that PDU. If the value of the counter is higher, the counter shall be decremented by that length, and the PDU is transmitted. Otherwise, the PDU shall be discarded and never delivered. The counter parameters are Cmax for the maximum value, and dC and dn for the count-up speed: the counter shall be increased by dC octets every dn slot, until it is capped at Cmax. If the transmission bit rate and the Physical Layer Convergence Procedure (PLCP) are known, these parameters are sufficient to define any access class that uses this mechanism. The value of Cmax shall be 9 188 octets.

Table A.1 lists the standardised access classes, together with their defining parameters in the case where the access protocol is Distributed Queue Dual Bus (DQDB).

Table A.1: Standardised access classes

Access rate (Mbit/s)		155,520		139,264		34,368		2,048	
Max. information rate (Mbit/s)		123,629		103,605		25,201		1,473	
Access class	Maximum allowed SIR (Mbit/s)	dC	dn	dC	dn	dC	dn	dC	dn
A	1,473	17	32	5	8	21	8	NA	NA
B	4 *	23	16	55	32	14	2	-	-
C	10 *	57	16	34	8	35	2	-	-
D	16 *	91	16	109	16	28	1	-	-
E	25,201	36	4	43	4	NA	NA	-	-
F	103,605	37	1	NA	NA	-	-	-	-
G	123,629	NA	NA	-	-	-	-	-	-

Key:

* : Nominal value. The exact values are for further study.

NA : Not Applicable. This means that in this case no definition of dC and dn values is required, as the maximum allowed SIR for the given access class corresponds to the maximum information rate supported by the considered access rate.

\- : The corresponding access class cannot be supported by the defined access rate.

SIR : Sustained Information Rate.

The maximum allowed SIR shall be calculated in terms of the dC and dn parameters as follows:

$$\text{Maximum allowed SIR (Mbit/s)} = \frac{(8 \times S)}{(125 \times 10^{-6})} \times \frac{dC}{dn}$$

with S defining the number of slots transmitted per 125 µs time interval:

S = 9 for the 34 Mbit/s PLCP;
S = 37 for the 140 Mbit/s PLCP;
S = 2 340/53 for the 155 Mbit/s PLCP.

The value of Cmax is 9 188 for all these cases.

If parts of the access capacity are reserved for other services, e.g. isochronous services (voice, video), the highest possible SIR for connectionless data service shall be reduced in proportion to the needs for these other services.

A.2 Access class mechanism for UNI

For further study.

A.3 Access class mechanism for USI

Not applicable.

Annex B (informative): Bibliography

The following references appear for information within the text of this part of ETS 300 217.

[B1] CCITT Recommendation I.130 (1988): "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[B2] DTR/NA-53202: "Complementary Information to ETS 300 217".

History

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