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Foreword

This ETSI Technical Report (ETR) has been prepared by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI).

ETRs are informative documents resulting from ETSI studies which are not appropriate for European Telecommunication Standard (ETS) or Interim European Telecommunication Standard (I-ETS) status. An ETR may be used to publish material which is either of an informative nature, relating to the use or application of ETSs, or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETSs.

This ETR has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI) and provides complementary information to ETS 300 217 [4].

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1 Scope

This ETSI Technical Report (ETR) provides complementary information to the European Telecommunication Standard (ETS) 300 217 [4].

2 References

The following references are used in this ETR.

[1] ISO/IEC 8802-3 (1988): "Information processing systems - Local area networks - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications".

[2] ISO/IEC 8802-5 (1992): "Information processing systems - Local area networks - Part 5: Token ring access method and physical layer specifications".

[3] ISO 9314: "Information processing systems - Fibre Distributed Data Interface (FDDI)".

[4] ETS 300 217: "Network Aspects (NA); Connectionless Broadband Data Service (CBDS)".

[5] ETS 300 211: "Network Aspects (NA); Metropolitan Area Network (MAN) Principles and architecture".

[6] ETS 300 275: "Network Aspects (NA); Metropolitan Area Network (MAN) Interconnection of MANs".

[7] CCITT Recommendation I.112 (1988): "Vocabulary of terms for ISDNs".

[8] ISO/IEC TR 10000-1 (1990): "Information technology - Framework and taxonomy of International Standardized Profiles - Part 1: Framework".

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

3 Definitions, symbols and abbreviations

3.1 Definitions

This ETR uses some of the terminology defined in other documents, as follows:

Access Facility (AF): as defined in ETS 300 211 [5].

MAN Switching System (MSS): as defined in ETS 300 211 [5].

Metropolitan Area Network (MAN): as defined in ETS 300 211 [5].

Protocol Data Unit (PDU): as defined in ETS 300 217 [4].

Quality Of Service (QOS): see ETS 300 217 [4].

service: see CCITT Recommendation I.112 [7], definition 201.

transit delay: as defined in ETS 300 217 [4].

user: see CCITT Recommendation I.112 [7], definition 401.

3.2 Symbols and abbreviations

AF	Access Facility
CBDS	Connectionless Broadband Data Service
CRC	Cyclic Redundancy Check
IMI	Inter MSS Interface
ISP	International Standardised Profile
LAN	Local Area Network
MAC	Medium Access Control
MAN	Metropolitan Area Network
Mbit/s	Megabit per second
MSS	MAN Switching System
PDU	Protocol Data Unit
QOS	Quality Of Service
UMI	User MAN Interface
UNI	User Network Interface
USI	User Specific Interface

4 Complementary information concerning individual bearer services at the USI

This Clause describes the different individual bearer services at the User Specific Interface (USI) and the interworking between users attached to different protocols and interfaces at the USI, User MAN Interface (UMI) and User Network Interface (UNI).

4.1 Description of the individual bearer services at the USI

The service is provided at the USI by Access Facility (AF) 2a, as described in ETS 300 211 [5], and can be accessed by different protocols. Therefore, various individual bearer services can be defined. Since the Connectionless Broadband Data Service (CBDS) is primarily aiming at the interconnection of Local Area Networks (LANs), primary candidates for the USI are the protocols that are specified in ISO Standard 8802-3 [1], ISO Standard 8802-5 [2] and ISO Standard 9314 (FDDI) [3].

NOTE: However, network providers are not forced to offer those and only those individual bearer services that are described in the following, because the LAN interfaces that are actually used may vary among different countries.

4.1.1 Individual bearer service 2

Individual bearer service 2 provides a LAN interface based on ISO Standard 8802-3 [1]. Individual bearer service 2 is part of the bearer service category CBDS (see ETS 300 217 [4]). In addition to the description of the general service, further study is required for provision of this individual bearer service.

4.1.2 Individual bearer service 3

Individual bearer service 3 provides a LAN interface based on ISO Standard 8802-5 [2], 4 Mbit/s. Individual bearer service 3 is part of the bearer service category CBDS (see ETS 300 217 [4]). In addition to the description of the general service, further study is required for provision of this individual bearer service.

4.1.3 Individual bearer service 4

Individual bearer service 4 provides a LAN interface based on ISO Standard 9314 (FDDI) [3]. Individual bearer service 4 is part of the bearer service category CBDS (see ETS 300 217 [4]). In addition to the description of the general service, further study is required for provision of this individual bearer service.

4.1.4 Individual bearer service 5

Individual bearer service 5 provides a LAN interface based on ISO Standard 8802-5 [2], 16 Mbit/s. Individual bearer service 5 is part of the bearer service category CBDS (see ETS 300 217 [4]). In addition to the description of the general service, further study is required for provision of this individual bearer service.

4.2 Addressing principles for the USI

One USI is identified by one CCITT Recommendation E.164 [9] number. The bridge/router serving the USI is responsible for the insertion of the CCITT Recommendation E.164 [9] source address in the PDUs sent towards the destination bridge/router.

In addition the bridge/router serving the USI is responsible for selection and insertion of the CCITT Recommendation E.164 [9] destination address on the basis of the 48 bit Media Access Control (MAC) destination address. The following two options are possible to implement this selection.

Option 1

In this case the relation between the different sets of 48 bit MAC addresses is static and has to be known to the service provider in advance.

This option allows the use of a static table for selection of the CCITT Recommendation E.164 [9] destination address.

Option 2

In this case the relation between the different sets of 48 bit MAC addresses and the corresponding CCITT Recommendation E.164 [9] numbers is dynamic and does not have to be known to the service provider in advance.

This option can be provided with a dynamic bridge/router. If the location of the 48 bit MAC destination address is not yet known to the bridge/router, the PDU may be lost or misdelivered. In order to reach the unknown destination the bridge/router may want to multi-cast the PDU using a group address. A general broadcast is excluded.

The consequences of the different aspects of this option for charging and for the Quality Of Service (QOS) are for further study.

4.3 Description of the interworking between the different individual bearer services at the USI

ISO/IEC JTC1 are working to define International Standardised Profiles (ISPs) (see ISO/IEC TR 10000-1 [8]) for transparent MAC bridging between LANs. For the definition of interworking of different individual bearer services at the USI, these functional profiles should be considered. The profiles identified as relevant are listed in table 1.

NOTE: However, as these functional profiles are not yet available, further study is needed before final decisions can be made. Particularly, care must be taken only to consider those parts of the functional profiles which are relevant to interworking aspects at the USI, in order to avoid contradictions with other draft ETSs.

Table 1: References to ISPs

Individual bearer service	2	3	4	5
2	-	RD53.53		RD51.53
3	RD53.53	-		RD51.53
4			-	RD51.54
5	RD51.53	RD51.53	RD51.54	-

5 Complementary information concerning QOS values

This Clause provides complementary information related to QOS values for ETS 300 217 [4].

5.1 Bearer service 1 QOS for MAN technology

This subclause covers the QOS values for the MAN technology. ATM based networks for the interconnection of MANs are not considered yet, but can be included in a further stage.

5.1.1 Reference configuration

In ETS 300 211 [5] a general architecture model for a MAN is given which consists of MSSs which are interconnected by a transit network. The transit network is reduced to point to point connection in ETS 300 275 [6]. The model as defined in figure 1 will be used as a reference configuration since the service is unrestricted and does not applies not only to this restricted configuration.

UMI: User MAN interface
IMI: Inter MSS Interface
AF: Access Facility
MSS: MAN Switching System

Figure 1: Reference Configuration for the calculation of the transit delay

5.1.2 Transit delay

One of the most important QOS parameters is the transit delay which the user will expect for the transfer of his data. A reference configuration is needed since the transit delay depends very much on special assumptions. Further a formula for calculation of the parameter values under certain assumptions is given.

5.1.2.1 Impacts on the transit delay

The calculation of the transit delay depends on certain assumptions which are to be made for the following items:

- PDU length;
- load;
- transmission rate;
- network elements;
- distance.

5.1.2.1.1 PDU length

The transit delay varies with the PDU length. This is because the time needed for the reassembly process and for the transfer of a PDU across the UMI depends on its length. Therefore calculations are made for the maximum payload length of the PDU which is 9 188 octets and for an average payload length of 1 000 octets. The influence of the reassembly process has to be taken into account for each network element which provides reassembly of the segments.

5.1.2.1.2 Load

The load on the access and on the MAN influences the transit delay. The network operator is not responsible for the user's access load and, therefore, calculation assumes a 0% load on the user's access. The queuing mechanism in the MSS will increase the delay under heavy load. An average load will be taken into account in the calculation.

5.1.2.1.3 Transmission rate

Table 2 gives some values for the time which is needed to transfer one PDU from the first bit to the last bit crossing the UMI with certain transmission rates. Two values per transmission rate are given, one for an average PDU payload length of 1 000 octets, the other for the maximum PDU payload length of 9 188 octets:

Table 2: Delay for one PDU for different transmission rates

	payload length of the PDU	
Transmission rate	**1 000 octets**	**9 188 octets**
2 Mbit/s	5,43 ms	49,9 ms
34 Mbit/s	0,31 ms	2,9 ms
140 Mbit/s	0,076 ms	0,7 ms
155 Mbit/s	0,065 ms	0,6 ms
NOTE: These values are only valid for the case where the PDUs are transferred in contiguous segments, which means that the load is 0% on the UMI.		

The customer can only choose a transmission rate for the access. What is inside the public network is the responsibility of the network provider and is not visible from outside. The network provider has to ensure, by his choice of equipment, that the value for the transit delay will be met.

5.1.2.1.4 Network elements

At each network node, a certain processing time is needed to provide the necessary functions like routing, screening, charging, segmentation and reassembly, etc. This means that for each network element which the data have to cross from the source to the destination, a certain delay has to be taken into account. Since the implementation of the internal network MSS is no matter for standardisation, only a rough value can be given.

5.1.2.1.5 Distance

The length of the paths between source UMI and destination UMI has to be taken into account. This distance will be included in the formula to calculate the transit delay.

5.1.2.2 Parameter values

Both terrestrial and satellites links may be used at the IMI. For the purpose of deriving figures for the transit delay, the following assumptions are made:

- the load on the access across the source UMI and destination UMI is 0%;

- the load within the public network (MSS, point-to-point interconnection) is 50%.

5.1.2.3 General formula

The transit delay depends on the following issues:

- the number of MSSs;

- the transit delay, dependent on the access rate at the source UMI;

- the transit delay, dependent on the access rate at the destination UMI;

- the distance between the source and the destination UMI.

Under the conditions given above a formula is given to calculate the transit delay for the reference configuration:

$$Transit\ delay = D_{RS} + D_{RD} + D_d + \sum_{i=1}^{X} D_{MSS_i}$$

D_{RS} = transit delay depending on the access rate at the source UMI.
D_{RD} = transit delay depending on the access rate at the destination UMI.
X = number of MSSs.
D_{MSS_i} = "processing delay" introduced by MSS_i.
D_d = delay introduced by the distance between the source UMI and the destination UMI.

D_d is mainly dependent on the unavoidable propagation delay in the physical medium when the distance between two MSSs exceeds about 500 km. The amount of the propagation delay is 0,005 ms/km in fibre optic cables (i.e. 15 ms for 3 000 km, 100 ms for 20 000 km) and 250 ms (fixed) in a satellite hop.

5.1.3 QOS values for MAN technology

The QOS values for the service offered at the UMI are given in table 3. The values contained in this table shall only be applicable for the UMI and shall not be seen as a prejudice for the other interfaces specified (USI and UNI). The values given for the UMI shall be seen as objectives rather than requirements. Therefore these values may not be directly inserted as requirements in a future release of ETS 300 217 [4], without revision.

Table 3: QOS values at the UMI

Attribute name	CBDS value at the UMI
Service availability	99,9% (see NOTE 1)
Lost PDU ratio	$< 1 * 10^{-4}$ (see NOTE 2)
Duplicated PDU ratio	$< 5 * 10^{-8}$
Misdelivered PDU ratio	$< 5 * 10^{-8}$
Undetected Error ratio	$< 5 * 10^{-12}$ (see NOTE 3)
Mis-sequenced PDU ratio	$< 5 * 10^{-8}$
Transit delay - individually addressed PDUs - group addressed PDUs	 see subclause 4.6 for further study (see NOTE 4)

NOTE 1: According to the definition of this parameter, the measurement of the value depends on the service availability decision parameters and their corresponding outage thresholds.

NOTE 2: For the measurement of this value, the following conditions shall apply:

- no congestion;
- 50% load of the network;
- no additional traffic at the incoming path (except load offered);
- 20% of the available bandwidth corresponds to the load offered;
- PDU length 1 000 octets;
- bit error rate of the transmission system 10^{-9}.

This value, as such, can not be used as a guarantee to the user. Therefore, further study is required before inserting this value into ETS 300 217 [4]. This parameter depends also on the user behaviour.

NOTE 3: This value is to be understood without taking into account the optional Cyclic Redundancy Check (CRC) - CRC32.

NOTE 4: The reference configuration does not define the destinations for group addressed PDUs. Only individually addressed PDUs were taken into account.

History

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