EUROPEAN TELECOMMUNICATION STANDARD

DRAFT
pr ETS 300 818

December 1996

Source: ETSI TC-NA

Reference: DE/NA-042123

ICS: 33.020

Key words: B-ISDN, ATM, retainability, performance

Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM); Retainability performance for B-ISDN switched connections

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Foreword

This draft European Telecommunication Standard (ETS) has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Public Enquiry phase of the ETSI standards approval procedure.

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

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1 Scope

The purpose of this European Telecommunication Standard (ETS) is to specify retainablility parameters and measurements methods for Broadband Integrated Services Digital Network (B-ISDN) point to point Asynchronous Transfer Mode (ATM) switched connections.

An International B-ISDN point to point ATM switched connection is partitioned into two National Portions (NPs), and an International Portion (IP).

The IP is further partitioned into connection portions delimited by international measurement points (MPIs) as defined in ITU-T Recommendation I.353 [1]: International Transit Portions (ITPs) and International Inter-operator Portions (IIPs).

A later version of this ETS will specify objectives for the retainability performance of National Portions, International Transit Portions and International Inter-operator Portions.

It is not currently planned to specify end-to-end objectives for retainability performance. Annex B provides guidelines for deriving end-to-end objectives from connection portion objectives.

2 Normative references

This ETS incorporates by dated and 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] ITU-T Recommendation I.353: "Reference events for defining ISDN and B-ISDN performance parameters".

[2] I-ETS 300 465: "Availability and Retainability performance for B-ISDN semi permanent connections".

[3] ITU-T Recommendation I.356: "B-ISDN ATM layer cell transfer performance".

NOTE: ITU-T Recommendation I.356 is used as a normative reference rather than the ETSI equivalent I-ETS 300 464, as ITU-T Recommendation I.356 contains important information yet to be incorporated in the I-ETS 300 464. It should be noted that the common material in the two standards is fully aligned.

3 Abbreviations

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

ATM	Asynchronous Transfer Mode
B-ISDN	Broadband Integrated Service Digital Network
IIP	International Inter-operator Portion
IP	International Portion
ITP	International Transit Portion
MPI	International Measurement Point
MPT	Measurement point at the T_B interface.
NP	National Portion
R	Retainability
SES_{ATM}	Severely Errored Second in the ATM layer

4 Introduction

An established B-ISDN point-to-point ATM switched connection should have a low probability of experiencing a cut-off. In this ETS, two possible causes of cut-off are identified:

- insufficient data transfer performance leading to 10 or more SES_{ATM} ;

- the failure or malfunctioning of some network element leading to a premature release of the connection.

The retainability performance of a B-ISDN point-to-point ATM switched connection portion is defined in this ETS as the probability that a B-ISDN switched connection portion once established, will neither experience 10 consecutive SES_{ATM} nor be prematurely released for a given duration. In this ETS, the retainability performance is specified in terms of cut-off rate.

5 B-ISDN connection portions

An international B-ISDN ATM switched connection consists of a number of connection portions, each delimited by either MPTs or MPIs; for definitions of MPTs and MPIs, including their locations, refer to ITU-T Recommendation I.353 [1].

For the purpose of performance management, ATM connections are divided into three types of connection portions: National Portions (NPs), International Transit Portions (ITPs) and International Inter-operator Portions (IIPs). The set of International Transit Portions and International Inter-operator Portions is the International Portion of the connection. For definitions of these portions, refer to ITU-T Recommendation I.356 [3].

6 Definition of Retainability parameters

6.1 Definition of a cut-off event

A cut-off event corresponds to the occurrence of 10 consecutive SES_{ATM} or to a premature release.

The definition of an SES_{ATM} outcome is given in I-ETS 300 465 [2].

A premature release is a release due to a switch or a cross-connect that is not the correct result of a user request.

Under normal conditions, connection release and call clearing are initiated when the user of the network sends a RELEASE message. The premature release corresponds to the case where a network equipment malfunction results in the release of an already established connection. The clearing of the call will be initiated either by the user or by the network by sending a RELEASE message.

NOTE 1: A premature release may occur independently of an SES_{ATM} outcome.

NOTE 2: If a connection has experienced a cut-off but has not been released by the network or by the user, then its performance is no longer considered.

6.2 Cut-off rate

The cut-off rate $\lambda(t)$ for a B-ISDN point-to-point ATM switched connection portion is defined as the limit, if this exists, of the ratio of the conditional probability that the time to cut-off of the connection, T, falls within the given time interval, $(t, t + \Delta t)$, to the length of this interval, Δt, when Δt tends to zero, given that the connection is not cut-off at the beginning of the time interval.

The instantaneous cut-off rate is expressed by:

$$\lambda(t) = \lim_{\Delta t \to 0+} \frac{\Pr\left(t < T \le t + \Delta t \middle| T > t\right)}{\Delta t}$$

In practice, the cut-off rate can only be measured on a set of connection portions. Annex A provides a method for measuring cut-off rate.

6.3 Retainability

The retainability R over a given interval [0,t] is the probability that a B-ISDN point-to-point switched ATM connection portion which was not cut-off at time 0, will not be cut off before time t.

If it is assumed that λ (t) is constant, i.e. λ (t) = λ, then the following relationship applies:

$$R(t) = \exp(-\lambda t)$$

7 Retainability performance objectives

Performance objectives for each type of connection portion (NP, ITP, IIP) will be defined in a later version of this ETS. It is not currently planned to specify end-to-end objectives for retainability performance.

Annex B provides guidelines for deriving end-to-end objectives from connection portion objectives.

The values given will be long term objectives. Achieving and testing the compliance with these objectives is under the responsibility of each network operator.

Guidance for testing compliance with these objectives is given in annex A.

Annex A (informative): Measurement and compliance testing for retainability performance

Practically, the cut-off rate for a B-ISDN point-to-point ATM switched connection portion of a given type (NP, ITP, IIP) is estimated by measuring the number of cut-off observed on a set of connections portions of this type, divided by the accumulated operation time of these connection portions during an observation period.

The cut-off rate of a given B-ISDN point-to-point ATM switched connection portion has a value which can only be measured over a large set of connections portions of the same type (theoretically over infinity). In practice the evaluation of the cut-off rate of a connection portion will take place on a relatively small set of connections. Therefore the value observed over this set will only be an estimate (in the statistical sense) of the true, but unknown value.

For compliance testing, the estimate is compared with limits. The limits derived from the objective values will be stated in a future issue of this ETS. This derivation assumes an a priori agreement on the probability of taking a false decision at the end of the test, due to sampling.

Annex B (informative): Calculation of end-to-end retainability performance

The purpose of this annex is to provide guidance for the calculation of the end-to-end retainability performance of an international switched ATM connection from the performance of its standardized connection portions.

It is assumed here that switched connections cannot be protected since the delay for triggering the protection is at least of the same order of magnitude as the time to declare a cut-off event due to the occurrence of 10 SES_{ATM}.

Under this assumption, the end-to-end cut-off rate is the sum of all the cut-off rates corresponding to the complete set of connection portions for the connection.

Moreover, the end-to-end retainability over this period of time is equal to the product of all the retainabilities corresponding to the various connection portions of the connection.

History

Document history			
December 1996	Public Enquiry	PE 120:	1996-12-16 to 1997-04-11