ETSI

ETSI
TECHNICAL
REPORT

ETR 123

March 1996

Second Edition

Source: ETSI TC-NA

Reference: RTR/NA-052217

ICS: 33.080

Key words: B-ISDN, charging

Broadband Integrated Services Digital Network (B-ISDN); Parameters and mechanisms provided by the network relevant for charging in B-ISDN

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

*

Contents

Blank page

Foreword

This ETSI Technical Report (ETR) has been produced 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 the application of ETSs or I-ETSs, or which is immature and not yet suitable for formal adoption as an ETS or an I-ETS.

Introduction

ETSI Sub-Technical Committee (STC) NA5 has worked with the technical aspects of Broadband Integrated Digital Network (B-ISDN) in the past and some ideas on charging have been elaborated. This ETR indicates the parameters and mechanisms which can be applied to charging in a B-ISDN.

Network capabilities for collection of charging information are strongly influenced by the charging principles used to charge future B-ISDN services. On the other hand, charging may influence the behaviour of the service subscribers and the balance of the total traffic load of the network. Finally, network capabilities for collection of charging information have also a relationship to signalling, traffic control and resource management.

Blank page

1 Scope

In Broadband Integrated Digital Network (B-ISDN), because of its innovative transfer mode, the information given in present recommendations on collection of charging information are not sufficient to cover all the capabilities that such a network is able to provide.

Therefore, this ETSI Technical Report (ETR) describes a first set of parameters relevant for charging and the mechanisms needed for collection of charging information of communication in the B-ISDN. The general principles for charging are listed which apply to B-ISDN. Nevertheless, further study is needed.

These parameters are applicable to all types of B-ISDN connections. Nevertheless an appropriate set of parameters should be selected for each connection type.

Collection of charging information will be done both by network operators and service providers for the usage of resources. This ETR describes parameters and mechanisms from a technical point of view. Therefore, the term "operator" is used throughout this ETR where it is applicable to service providers, to network operators, or to both service providers and network operators.

Accounting, tariffing and billing of B-ISDN services are outside the scope of this ETR.

2 References

For the purposes of this ETR, the following references apply:

[1] CCITT Recommendation D.210: "General charging and accounting principles for international telecommunication services provided over the Integrated Services Digital Network (ISDN)".

[2] CCITT Recommendation D.211: "International accounting for the use of the Signal Transfer Point (STP) in CCITT Signalling System No. 7".

[3] CCITT Recommendation D.220: "Charging and accounting principles to be applied to international circuit mode bearer services provided over the integrated services digital network (ISDN)".

[4] CCITT Recommendation D.230: "General charging and accounting principles for supplementary services associated with international telecommunication services provided over the Integrated Services Digital Network (ISDN)".

[5] CCITT Recommendation D.231: "Charging and accounting principles relating to the User-to-user Information (UUI) supplementary service".

[6] CCITT Recommendation D.250: "General charging and accounting principles for non-voice services provided by interworking between the ISDN and existing public data networks".

[7] CCITT Recommendation D.251: "General charging and accounting principles for the basic telephone service provided over the ISDN or by interconnection between the ISDN and the public switched telephone network".

> NOTE 1: In the above D-series Recommendations, the attention is focused on the collection of charges and accounting, no information is given on the network capabilities for charging.

[8] CCITT Recommendation I.141: "ISDN network charging capabilities attributes".

> NOTE 2: In CCITT Recommendation I.141, only a table is provided on candidate network charging capability attributes (parameters).

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

[10] ITU-T Recommendation I.371: "Traffic control and congestion control in B-ISDN".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this ETR, the following definitions apply:

Network charging capabilities: a set of procedures performed by the network elements in order to determine all the parameters of one communication session, which are required for assessing the effort provided by the network, and to determine the values of these parameters.

Network operator: entity which provides the network operating elements and resources for the actual execution of services.

Service provider: entity which offers services for service subscription. The network operator may be the service provider.

Service subscriber: entity which subscribes to a service offered by the service provider.

3.2 Abbreviations

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

AAL	ATM Adaptation Layer
ATM	Asynchronous Transfer Mode
B-ISDN	Broadband Integrated Services Digital Network
CAC	Connection Admission Control
CBR	Constant Bit Rate
CL	Connectionless
CLP	Cell Loss Priority
DCF	Data Communications Facility
MAN	Metropolitan Area Network
N-ISDN	Narrowband Integrated Services Digital Network
NPC	Network Parameter Control
OAM	Operation And Maintenance
OS	Operations System
QoS	Quality of Service
UPC	Usage Parameter Control
VCC	Virtual Channel Connection
VPC	Virtual Path Connection

4 Charging principles applied to the B-ISDN

In order to better understand which network capabilities are necessary, the following principles for charging are assumed to be correct:

- it is possible to charge the originating service subscriber, the destination service subscriber or split the charging;

- they shall allow the presentation of the charging information to the service subscriber in due time (e.g. during the call);

- it is possible that services offered by both Narrowband Integrated Services Digital Network (N-ISDN) and B-ISDN have the same charges independently on the charging method;

- it is possible to reflect a relationship between the supporting resources and the service with its parameters (e.g. quality and traffic parameters);

- it is possible to charge for the actual usage of a non-Constant Bit Rate (CBR) connection;

5 Parameters relevant for charging in B-ISDN

5.1 List of parameters

Collection of charging information can be based on parameters and factors seized by the network in real time. Weighting factors may influence the conversion of parameters into charges to the service subscriber. Which parameters are used and how they are weighted is a matter of tariffing and out of the scope of this ETR.

Collection of charging information of the B-ISDN may be divided into two fundamental components:

- the access component; and

- the utilization component (see CCITT Recommendation D.210 [1]).

The following is a list of parameters for both components, which might be relevant for collection of charging information in a B-ISDN.

A) parameters related to the subscription (access component).

   These parameters allow to compensate operators for the facilities required for a service subscriber to access a service or services (e.g. those facilities specifically provided to that service subscriber), they are independent of the utilization:

   A1) type of access;

B) parameters related to the connection (utilization component).

   Utilization charges should be in accordance with the service requested by the service subscriber. These charges should in principle be determined on the basis of the network resources and any additional functions required to provide the service to the service subscriber. These should be possible by considering a set out of the following parameters.

   It should be noted that the values of the following parameters should be collected for each direction of a connection within a B-ISDN call (connections can be asymmetric and a call can be composed of several connections):

   B1) fixed.

      This component reflects the utilization of the control resources like:

      B1.1)   call set up;
      B1.2)   call attempt;
      B1.3)   type of service;

   B2) the call characteristics.

      This component reflects the utilization of switching and transmission resources:

      B2.1)   called party;
      B2.2)   duration;
      B2.3)   time of day - day of week - day of the year;
      B2.4)   priority;
      B2.5)   provided Quality of Service (QoS);
      B2.6)   traffic contract parameters;
      B2.7)   violation of traffic contract parameters;
      B2.8)   reserved resources;
      B2.9)   volume actually used;
      B2.10)   multipoint aspects, if applicable.

The charging of supplementary services is outside the scope of this document. No specific charging should be done for signalling according to CCITT Recommendation D.211 [2]. In general, this is satisfied by B1) above. Nevertheless the use of such supplementary services can be derived from the signalling.

The above list covers all aspects relevant for collection of charging information in B-ISDN at this point in time. Nevertheless, it might be possible that the parameters listed above will not be sufficient in the future and that evolving new services will lead to additional parameters that do need to be measured inside the network.

5.2 Description of the parameters

This subclause describes the parameters listed in subclause 5.1 in detail.

A1) Type of access

This parameter is related to the capacity provided by the network operator, the maintenance, the redundancy, etc. (e.g. number of links installed, bit rate of the links 155 Mbit/s vs. 622 Mbit/s), independently of the actual use.

B1.1) Call set up

This parameter corresponds to the usage of the common and distributed resources (processing, signalling, etc.) for the set-up/modification of each connection.

B1.2) Call attempt

This parameter corresponds to the resources used by the network to offer the call to the called party. It requires the capability of detecting and communicating the reason of the unsuccessful attempt.

B1.3) Type of service

This parameter can be derived from the signalling messages exchanged at call setup and allows the operator to have a different weighting of the various parameters depending on the type of service. This includes also the access to common resources (e.g. servers). Further considerations are out of the scope of this document.

B2.1) Called party

In a two party call, this parameter may be used to take into account the geographical distance between both parties (usually in fixed steps). In case of on demand connections this parameter can be represented by the E.164 address.

B2.2) Time stamps of connection related events

This parameter is related to a set of time stamps associated to the start and the end of a connection and to the relevant variations during the connection (e.g. change of traffic contract, change of tariff, etc.) These time stamps can be used to calculate the duration of the connection or phases of the connection. (A phase of a connection is delimited by two consecutive connection related events.) In each phase of a connection an own set of measurements is collected.

If it is possible to detect times of unavailability the start and stop of these times have to be considered as relevant elements and time stamped accordingly.

B2.3) Time of day - day of week - day of the year

These parameters allow to encourage a better distribution of the user traffic over the time and may be applied in different ways to different services.

B2.4) **Priority**

Two types of priorities are supposed which are:

- implicit priority;

- explicit priority.

The first type is connected to the possibility of using Virtual Path Connection/Virtual Channel Connection (VPC/VCC) having implicitly high priority in the network.

For the second type, the Cell Loss Priority (CLP) mechanism manipulated by the service subscriber at cell level may be considered but requires some clarification.

B2.5) **Provided QoS**

This complex parameter should be considered split into its component parameters, based on ITU-T Recommendation I.356 [9]. In fact, different services are sensitive to different parameters.

Some classes of quality may be defined, in a way understandable to the service subscriber who can choose the class which is appropriate to his needs.

B2.6) **Traffic contract parameters**

The parameters are described in ITU-T Recommendation I.371 [10], as part of the traffic contract.

B2.7) **Violation of traffic contract parameters**

This parameter is related to the transport of cells which are violating the traffic contract in case of using the tagging option.

B2.8) **Reserved resources**

This parameter deals mainly with the allocated resources. For each type of service subscriber request a reference value of allocated resources should be provided. The resources actually allocated may depend on the QoS required.

B2.9) **Volume actually used**

This parameter requires a traffic measurement for all phases of a connection.

B2.10) **Multipoint aspects**

"Multipoint aspects" is not a parameter itself but may influence some of the other parameters. This point is for further study.

6   Charging mechanisms required in B-ISDN

The following functions and capabilities are part of the charging entity in the network element:

-    functions for the measuring of the parameters;

-    an activity generating charging records from the measured data and reports for the Operations System (OS);

-    a storage function, necessary for storage of charging records over a limited period of time;

-    the capability to detect whether there is still sufficient storage capacity for new records;

-    a timer function to be able to send reports to the Operations System (OS) at regular intervals;

-    a Data Communications Facility (DCF) for communication with the Operations System (OS) for e.g. conveying data records and alarms;

-    availability control and performance monitoring. Recording and communication of relevant events. This has not necessarily to be done in real-time.

Only the first point will be dealt with in this clause. The other points are more or less related to accounting functions and have no direct impact on the network.

Clause 5 list a variety of parameters relevant for the collection of charging information for a B-ISDN connection. This clause describes how the parameters can be measured.

The parameters can be divided into three categories:

-    parameters which are relevant for service providers without impacting the network. This category covers all parameters related to the subscription (point A) in clause 5);

-    parameters which impact the network and are well known from today's networks. This category covers the parameters related to the utilization of control resources (point B1) and the parameters called party, duration, time of day - day of week - day of the year, reserved resources - points B1), B2.2), B2.3) and B2.8);

-    parameters which impact the network and are related to the ATM technique.

Only the third category which is specific to the ATM technique will be dealt with in the following paragraphs. All these measurements are mainly made at the ATM layer; no higher layers of the user plane (especially ATM Adaptation Layer (AAL)) are engaged.

Measuring of priority:

-    implicit priority.

    Information on implicit priority can be obtained from signalling. Verification of the degree of priority is obtained considering the cell loss rate with respect to the total load of the network. This may be done by the system management;

-    explicit priority.

    If CLP is used different measurements for both classes may be needed.

Measuring of provided QoS:

- the only method to measure the quality is the activation of performance monitoring for a given VPC/VCC (Operation And Maintenance (OAM) flow F4/F5). So if QoS is charged performance monitoring has to be activated and the result of performance monitoring has to be forwarded to the charging entity. This parameter can only be applied to the limited number of VPCs/VCCs for which performance monitoring is activated.

Measuring of traffic contract parameters:

- this information can be obtained from the entity for connection admission control.

Measuring of violation of traffic contract parameters:

- measurement of the number of cells violating parameters is done at the entrance of the network. It should be performed both at Usage Parameter Control (UPC) and Network Parameter Control (NPC). It may be useful information related to the performance degradation, even in the case in which the violated cells are discarded.

Measuring of reserved resources:

- this information can be obtained from the entity for connection admission control.

Measuring of the volume actually used:

- this information can be obtained by counting all cells passing the UPC function, separately for CLP=0 and CLP=1.

Measuring of the traffic characteristic of the source:

- this information can be obtained from the entity for Usage Parameter Control. Whether this information is sufficient for collection of charging information is for further study.

History

Document history		
February 1994	First Edition	
March 1996	Second Edition	