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SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – B-ISDN application protocols for access signalling

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Digital Subscriber Signalling System No. 2 – Additional traffic parameters: Signalling capabilities to support traffic parameters for the available bit rate (ABR) ATM transfer capability

ITU-T Recommendation Q.2961.3

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.2961.3

DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 2 – ADDITIONAL TRAFFIC PARAMETERS: SIGNALLING CAPABILITIES TO SUPPORT TRAFFIC PARAMETERS FOR THE AVAILABLE BIT RATE (ABR) ATM TRANSFER CAPABILITY

Summary

Available Bit Rate (ABR) refers to an ATM transfer capability where the limiting ATM layer transfer characteristics provided by the network may change subsequent to connection establishment. It is expected that a user which adapts its traffic to the changing ATM layer transfer characteristics will experience a low cell loss ratio.

Recommendation Q.2961 covers the support of additional traffic parameters for the B-ISDN at the T_B reference point or coincident S_B and T_B reference point as defined in Recommendation I.413 by means of the DSS 2. This Recommendation defines the DSS 2 protocol procedures, formats and functions needed to support the ABR ATM transfer capability as defined in Recommendation I.371. This Recommendation includes the use of the DSS 2 signalling procedures for the negotiation of Minimum Cell Rate (MCR) during call establishment. ABR precludes use of DSS 2 signalling procedures for the modification of traffic parameters during the active phase of the call.

Source

ITU-T Recommendation Q.2961.3 was prepared by ITU-T Study Group 11 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the12th of September 1997.

FOREWORD

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The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 2 – ADDITIONAL TRAFFIC PARAMETERS: SIGNALLING CAPABILITIES TO SUPPORT TRAFFIC PARAMETERS FOR THE AVAILABLE BIT RATE (ABR) ATM TRANSFER CAPABILITY

(Geneva, 1997)

1 Scope

Recommendation Q.2961 covers the support of additional traffic parameters for the Broadband Integrated Services Digital Network (B-ISDN) at the T_B reference point or coincident S_B and T_B reference point as defined in Recommendation I.413 [1] by means of the Digital Subscriber Signalling System No. 2 (DSS 2). This Recommendation defines the DSS 2 protocol procedures, formats and functions needed to support the identified ATM traffic-related additional capabilities.

This Recommendation is part of the DSS 2 family of Recommendations; it specifies extensions to Recommendation Q.2931, and does not repeat states, information elements, messages and procedures contained therein, but only specifies extensions related to additional traffic parameter indications.

This Recommendation defines the additional traffic parameters required for the support of the Available Bit Rate (ABR) ATM transfer capability as defined in Recommendation I.371 [3].

This Recommendation includes the use of the DSS 2 signalling procedures for the negotiation of traffic parameter Minimum Cell Rate (MCR) during call establishment. ABR precludes use of DSS 2 signalling procedures for the modification of traffic parameters during the active phase of the call.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1] ITU-T Recommendation I.413 (1993), *B-ISDN user-network interface*.

[2] ITU-T Recommendation Q.2931 (1995), *Digital subscriber Signalling System No. 2 – User-Network Interface (UNI) layer 3 specification for basic call/connection control.*

[3] ITU-T Recommendation I.371 (1996), *Traffic control and congestion control in B-ISDN*.

[4] ITU-T Recommendation I.150 (1993), *B-ISDN asynchronous transfer mode functional characteristics*.

[5] ITU-T Recommendation Q.2951.1 (1995) *Stage 3 description for number identification supplementary services using B-ISDN Digital Subscriber Signalling System No. 2 (DSS 2) – Basic call: Direct-Dialling-In (DDI).*

[6] ITU-T Recommendation Q.2957.1 (1995), *Stage 3 description for additional information transfer supplementary services using B-ISDN Digital Subscriber Signalling System No. 2 (DSS 2) – Basic call: User-to-User Signalling (UUS).*

[7] ITU-T Recommendation Q.2961.2 (1997), *Digital subscriber Signalling System No. 2 – Additional traffic parameters: Support of ATM transfer capability in the broadband bearer capability information elements*.

[8] ITU-T Recommendation Q.2962 (1996), *Digital subscriber Signalling System No. 2 – Connection characteristics negotiation during call/connection establishment phase.*

[9] ITU-T Recommendation Q.2963.1 (1996), *Digital subscriber Signalling System No. 2 – Connection modification: Peak cell rate modification by the connection owner*.

[10] ITU-T Recommendation Q.2955.1 (1997), *Stage 3 description for community of interest supplementary services using B-ISDN Digital Subscriber Signalling System No. 2 (DSS 2): Closed User Group (CUG).*

3 Definitions

The definitions of Annex J/Q.2931 [2] apply. In addition, this Recommendation defines the following terms:

3.1 Cell Loss Priority (CLP): A one-bit indication in the header of each ATM cell. This bit indication may be used by the user to generate traffic flows with two different cell loss ratio objectives, as defined in Recommendation I.150 [4].

3.2 traffic contract: A traffic contract specifies the negotiated traffic and QOS characteristics of an ATM layer connection at the B-ISDN UNI (see Recommendation I.371 [3]).

3.3 traffic control: Traffic control at the ATM layer refers to the set of actions taken by the network to avoid congested conditions. A list of traffic control functions is given in Recommendation I.371. [3]

3.4 traffic parameters: A traffic parameter is a specification of a particular traffic aspect. It may be quantitative or qualitative. Traffic parameters may for example describe peak cell rate, minimum cell rate, etc.

4 Abbreviations

The abbreviations of Annex J/Q.2931 [2] apply. This Recommendation also uses the following abbreviations:

ABR Available Bit Rate

CLR Cell Loss Ratio

FRT Cumulative RM Fixed Round-trip Time

ICR Initial Cell Rate

MCR Minimum Cell Rate

PCR Peak Cell Rate

RDF Rate Decrease Factor

RIF Rate Increase Factor

RM ATM Resource Management Cell

TBE ABR Transient Buffer Exposure

5 Description

This Recommendation specifies the signalling of additional traffic parameters beyond the ones already specified by Recommendation Q.2931 [2]. In particular, the support of traffic parameters for ABR is specified.

ABR is an ATM transfer capability where the limiting ATM layer transfer characteristics provided by the network may change subsequent to connection establishment. It is expected that a user that adapts its traffic to the changing ATM layer transfer characteristics will experience a low Cell Loss Ratio (CLR).

The calling user shall specify a maximum required bandwidth Peak Cell Rate (PCR) to the network on establishment of connection for which it requests the use of the ABR ATM transfer capability. The maximum required bandwidth is negotiated between user and network and between user and user at connection establishment. A minimum available bandwidth [also referred to as the Minimum Cell Rate (MCR)] shall be specified on a per-connection basis. The value of the PCR and of the MCR can be different for each direction of a bidirectional connection.

Traffic parameter modification using procedures of Recommendation Q.2963.1 [9] are precluded during the active phase of the call.

6 Operational requirements

6.1 Provision and withdrawal

The additional traffic indications may be included in signalling messages by the user as specified in this Recommendation provided that a prior arrangement is made with the service provider.

6.2 Requirements at the originating network side

The procedures according to clause 9 shall apply.

6.3 Requirements at the terminating network side

The procedures according to clause 9 shall apply.

7 Primitive and state definitions

7.1 Primitive definitions

Clause 8/Q.2931 shall apply.

7.2 Call states

See clause 2/Q.2931. No additional call states are defined.

8 Coding requirements

8.1 Messages

No additional messages are specified beyond the ones of 3.1/Q.2931. The existing Q.2931 messages that have had their contents modified to support the additional traffic parameters are described below.

8.1.1 Connect

This message is sent by the called user to the network and by the network to the calling user to indicate call acceptance by the called user. See Table 1 for additions to the structure of this message shown in Table 3-2/Q.2931.

Table 1/Q.2961.3 – CONNECT message additional content

Message type: CONNECT Significance: Global Direction: Both				
Information element	**Reference**	**Direction**	**Type**	**Length**
ABR setup parameters	8.2.2	Both	O (Note 1)	4-32
ATM traffic descriptor	8.2.1	Both	O (Note 2)	12-20
NOTE 1 – Mandatory when the broadband transfer capability field indicates "ABR" in the SETUP message. NOTE 2 – Mandatory when the broadband transfer capability field indicates "ABR" in the SETUP message; contains the PCR and the MCR subfields.				

8.1.2 SETUP

This message is sent by the calling user to the network and by the network to the called user to indicate call establishment. See Table 2 for additions to the structure of this message shown in Table 3-19/Q.2931.

Table 2/Q.2961.3 – SETUP message additional content

Message type: SETUP Significance: Global Direction: Both				
Information element	**Reference**	**Direction**	**Type**	**Length**
ABR setup parameters	8.2.2	Both	O (Note 1)	4-32
ATM traffic descriptor	8.2.1	Both	M (Note 2)	12-20
Minimum acceptable ATM traffic descriptor	8.2.4	Both	O (Note 3)	4-12
NOTE 1 – Mandatory when the broadband transfer capability field indicates "ABR" in the broadband bearer capability information element. NOTE 2 – As a user option the calling user may indicate the ABR minimum cell rate. The MCR shall be included in the network-to-user direction and at the T_B reference point. NOTE 3 – The minimum acceptable ATM traffic descriptor information shall be included in the SETUP message when the calling user wants to allow negotiation of MCR during call/connection establishment.				

8.2 Information elements

See clause 4/Q.2931. The coding of the ATM traffic descriptor information element is extended and is shown in 8.2.1.

8.2.1 ATM traffic descriptor

The ATM traffic descriptor information element as specified in Recommendation Q.2931 is extended as shown in Figure 1 and Table 3.

For ABR, the PCR(0 + 1) parameters and the ABR MCR(0 + 1) parameters include user originated Resource Management (RM) cells with CLP = 0 in addition to the sum of the user plane information rate and all end-to-end user originated OAM F5 flow. For ABR, user originated RM cells with CLP = 1 are not included in these parameters (see Recommendation I.371 [3] for the handling of RM cells with CLP = 1).

8	7	6	5	4	3	2	1	Octets
								1-4, groups 7 and 8 see Q.2931
Forward ABR minimum cell rate identifier (CLP = 0 + 1)								
1	0	0	1	0	0	1	0	9* (Note)
Forward ABR minimum cell rate (for CLP = 0 + 1)								9.1*
								9.2*
								9.3*
Backward ABR minimum cell rate identifier (CLP = 0 + 1)								
1	0	0	1	0	0	1	1	10* (Note)
Backward ABR minimum cell rate (for CLP = 0 + 1)								10.1*
								10.2*
								10.3*

NOTE – Included when the broadband transfer capability field indicates "ABR" in the broadband bearer capability information element. At the coincident S_B/T_B reference point. It is optional in the user-to-network direction and mandatory in the network-to-user direction in a SETUP message. At the T_B reference point, it is mandatory in both directions in a SETUP message. Mandatory in both directions in a CONNECT message.

Figure 1/Q.2961.3 – ATM traffic descriptor information element for ABR

Table 3/Q.2961.3 – ATM traffic descriptor information element content

– Forward/backward ABR minimum cell rate (octets i.1-i.3, where i may have the values 9-10): The forward and backward ABR minimum cell rate indicates the minimum cell rate requested. A value expressing in pure 3 octet integer representation the number of cells per second, with bit 8 of the first octet being the most significant bit, and bit 1 of the third octet being the least significant bit. The "forward" direction is defined as that from the calling user to the called user. The "backward" direction is the reverse, i.e. from the called user to the calling user (see Annex J/Q.2931 [2]).

8.2.2 ABR setup parameters

The purpose of the ABR setup parameters information element is to specify the set of ABR parameters during call/connection establishment and is shown in Figure 2 and Table 4. The maximum length of this information element is 32 octets.

8.2.3 Broadband bearer capability

The Broadband bearer capability information element is specified in Recommendation Q.2961.2 [7] and is used to explicitly identify the ATM transfer capability as indicated below.

A new codepoint is added to the BTC field of the broadband bearer class information element to indicate ABR. Accordingly, insert the following in the part of Table 1/Q.2961.2 entitled "Values used on transmission and reception" after the entry "0 0 0 1 0 1 1 SBR1 (Note 6) with end-to-end timing not required":

0 0 0 1 1 0 0 ABR

The allowed combinations of the broadband transfer capability (octet 5a) and of the bearer class (octet 5) fields in the Broadband bearer capability information element are defined in Annex A.

8.2.4 Minimum acceptable ATM traffic descriptor

The minimum acceptable ATM traffic descriptor information element is specified in Recommendation Q.2962 [8] and is extended as shown in Figure 3 and Table 6.

8	7	6	5	4	3	2	1	Octets
ABR setup parameters information element identifier								
1	0	0	0	0	1	0	0	1
Ext.	Coding std.		IE instruction field					
1			Flag	Reserv.	Action ind.			2
Length of ABR setup parameter contents								3 4
Forward ABR initial cell rate identifier (CLP = 0 + 1)								
1	1	0	0	0	0	1	0	5* (Note)
Forward ABR initial cell rate (for CLP = 0 + 1)								5.1* 5.2* 5.3*
Backward ABR initial cell rate identifier (CLP = 0 + 1)								
1	1	0	0	0	0	1	1	6* (Note)
Backward ABR initial cell rate (for CLP = 0 + 1)								6.1* 6.2* 6.3*
Forward ABR transient buffer exposure identifier								
1	1	0	0	0	1	0	0	7* (Note)
Forward ABR transient buffer exposure								7.1* 7.2* 7.3*
Backward ABR transient buffer exposure identifier								
1	1	0	0	0	1	0	1	8* (Note)
Backward ABR transient buffer exposure								8.1* 8.2* 8.3*
Cumulative RM fixed round-trip time identifier								
1	1	0	0	0	1	1	0	9* (Note)
Cumulative RM fixed round-trip time								9.1* 9.2* 9.3*
Forward rate increase factor identifier								
1	1	0	0	1	0	0	0	10* (Note)
Forward rate increase factor								10.1*
Backward rate increase factor identifier								
1	1	0	0	1	0	0	1	11* (Note)
Backward rate increase factor								11.1*
Forward rate decrease factor identifier								
1	1	0	0	1	0	1	0	12* (Note)
Forward rate decrease factor								12.1*
Backward rate decrease factor identifier								
1	1	0	0	1	0	1	1	13* (Note)
Backward rate decrease factor								13.1*

NOTE – All the parameters are position independent. This parameter is optional in the user-to-network direction in a SETUP message. Mandatory in the network-to-user direction and at the T_B reference point in a SETUP message. Mandatory in both directions in a CONNECT message.

Figure 2/Q.2961.3 – ABR setup parameters information element

Table 4/Q.2961.3 – ABR setup parameters information element content

– Forward/backward ABR Initial Cell Rate (ICR) (octets i.1-i.3, where i may have values 5 or 6) The forward and backward ICR indicates the initial cell rate for the connection. A value expressing in pure 3 octet integer representation the number of cells per second, with bit 8 of the first octet being the most significant bit and bit 1 of the third octet being the least significant bit.
– Forward and backward ABR Transient Buffer Exposure (TBE) (octets i.1-i.3, where i may have values 7 or 8) These values are coded in cells. It is the number of cells which can be supported for a given connection starting up before the control loop is established. It is coded as a 24-bit binary integer, with bit 8 of the first octet being the most significant bit and bit 1 of the third octet being the least significant bit.
– Cumulative RM Fixed Round-Trip Time (FRT) (octets 9.1-9.3) This parameter is used to accumulate the sum of all the fixed propagation delays in the round-trip call path from the source to the destination and back for ABR RM cells. It is coded as a 24-bit binary integer number of microseconds, with bit 8 of the first octet being the most significant bit and bit 1 of the third octet being the least significant bit.
– Forward and backward Rate Increase Factor (RIF) (octets i.1, where i may have values 10 or 11) This parameter controls the rate at which the cell transmission rate increases. It is signalled as $\log_2$ (RIF $\times$ 32768). The range of this parameter is 0-15. It is coded as an 8-bit binary integer, with bit 8 being the most significant bit and bit 1 being the least significant bit.
– Forward and backward Rate Decrease Factor (RDF) (octets i.1, where i may have values 12 or 13) This parameter controls the rate at which the cell transmission rate decreases. It is signalled as $\log_2$ (RDF $\times$ 32768). The range of this parameter is 0-15. It is coded as an 8-bit binary integer, with bit 8 being the most significant bit and bit 1 being the least significant bit.

9 Signalling procedures at the coincident S_B and T_B reference point

The procedures for basic call/connection control as defined in clause 5/Q.2931 [2] shall apply. Only additional procedures to handle the point-to-point ABR call/connections are described in the following subclauses. These procedures shall only apply when the SETUP message contains a Broadband bearer capability information element indicating "ABR" in the broadband transfer capability field.

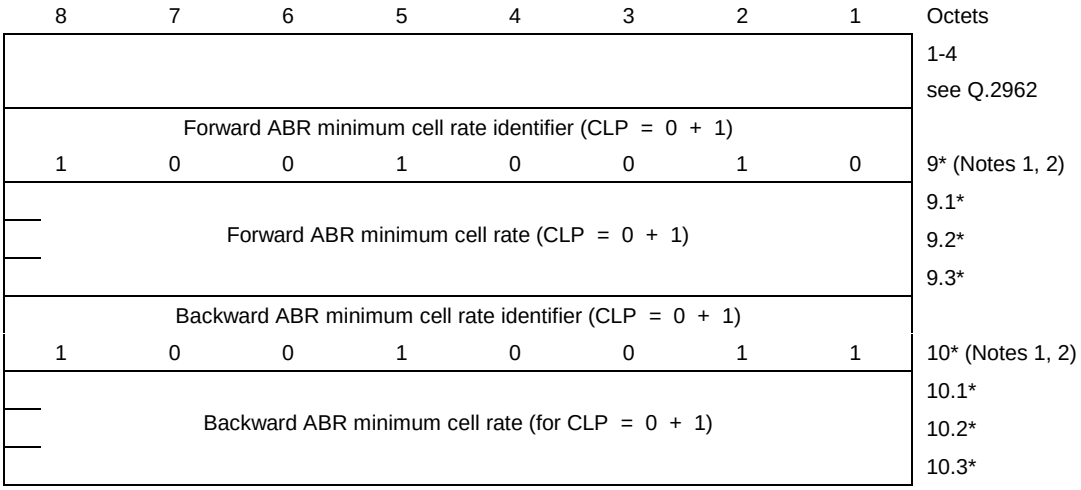
Traffic parameter modification using procedures of Recommendation Q.2963.1 [9] are precluded during the active phase of the call.

9.1 Call/connection establishment at the originating interface

The procedures as described in 5.1.1/Q.2931 shall apply with the following changes.

The calling party initiates ABR call establishment by sending a SETUP message across its user-network interface. The SETUP message shall contain a Broadband bearer capability information element indicating "ABR" broadband transfer capability field and "point-to-point" in the user plane connection configuration field. The ABR setup parameters information element is also mandatory in the SETUP message.

ABR parameters for a given (forward or backward) direction may be included in the ABR setup parameters information element only if the ATM traffic descriptor information element contains a non-zero PCR (CLP = 0 + 1) value for that direction.



NOTE 1 – All the parameters are position independent.

NOTE 2 – May be included when the broadband transfer capability field indicates "ABR" in the Broadband bearer capability information element and the calling user wants to allow MCR negotiation during the call/connection establishment.

Figure 3/Q.2961.3 – Minimum acceptable ATM traffic descriptor information element

Table 6/Q.2961.3 – Minimum acceptable ATM traffic descriptor information element content

– Forward/backward ABR minimum cell rate (octets i.1-i.3, where i may have the values 9-10): The forward and backward MCR indicates the minimum cell rate requested. A value expressing in pure 3 octet integer representation the number of cells per second, with bit 8 of the first octet being the most significant bit and bit 1 of the third octet being the least significant bit. The "forward" direction is defined as that from the calling user to the called user. The "backward" direction is the reverse, i.e. from the called user to the calling user (see Annex J/Q.2931 [2]).

If the calling user is requesting an ABR ATM transfer capability, the following additional rules apply:

- Tagging shall not be requested.
- The calling user may include the MCR parameter in the ATM traffic descriptor information element for one or both directions (provided that the PCR (CLP = 0 + 1) parameter value is different from zero for that direction).
- The cumulative RM fixed round-trip time parameter in the ABR setup parameters information element shall be set to the calling user's RM cell delay contribution for the forward and backward directions of the connection.
- In the ABR setup parameters information element, the calling user may include value(s) for ICR, TBE, RIF and RDF in one or both directions.
- If the calling user wants to allow negotiation of the MCR parameter, the corresponding MCR parameter is included in the minimum acceptable ATM traffic descriptor parameters information element.

9.1.1 Traffic parameters selection procedures

The procedures of 5.1.3/Q.2931 shall apply with the following changes.

In the case of an ABR connection, the following additional rules apply.

If the user does not specify a value for a particular parameter in a given direction, the network shall supply a default value. For the forward and backward MCR parameters, the default value is zero; for forward and backward ICR parameters, the default value is equal to the forward and backward PCR parameters value, respectively.

In case of TBE, the default value is the largest allowed value; for RIF, the default value is 1 which is encoded as 15 (decimal); and for RDF, the default value is 1/32768 which is encoded as 0. The default values supplied by the network (as possibly modified by the procedures below) are included by the network in the SETUP message, and delivered to the called user.

The selection procedures by the network for the ABR service is described below.

MCR can be negotiated using the procedures described in Recommendation Q.2962 [8], if the corresponding MCR parameter is included in the minimum acceptable ATM traffic descriptor information element in the SETUP message. No other parameters can be negotiated using the procedures of Recommendation Q.2962.

Parameter values for a given direction for PCR in the ATM traffic descriptor information element and ICR, TBE, RIF and RDF in the ABR setup parameters information element can be selected by the network.

If able to provide the indicated PCR and ABR setup parameter values, the network shall progress the call towards the called user, without changing the original parameters.

If unable to provide the indicated PCR, but able to provide at least the indicated MCR, the network shall progress the call towards the called user, after adjusting the PCR parameter to the value that can be provided. The adjusted PCR value shall be greater than or equal to the indicated MCR for the same direction.

When progressing the call, the network may, if necessary, also adjust the following ABR setup parameters: ICR, TBE, RIF and RDF. The network may adjust either or both "forward" and "backward" parameters of these four parameters.

Table 7 summarizes the modifications that the network may take on the ABR-related traffic parameters.

Table 7/Q.2961.3 – Modification of ABR parameters by the network

Parameter for a given direction	Modification by the network
PCR	Decrease only
ICR	Decrease only
TBE	Decrease only
RIF	Decrease only
RDF	(Note)
NOTE – The values of RDF may be increased or decreased, subject to the constraint that the ratio RDF/RIF shall not be decreased. (Hence, if RIF is decreased by a factor *k*, RDF may be decreased by at most a factor *k*, or it may be increased.)	

The traffic parameter selection procedure shall maintain the following invariant:

$$MCR \leq ICR \leq PCR$$

If the network is not able to provide PCR with a value greater than or equal to MCR, then the connection shall be cleared with Cause No. 37, "User cell rate not available".

Note that the negotiation specified above occurs after parameter defaulting, if applicable.

The network shall adjust the FRT parameter in the ABR setup parameters information element when forwarding a SETUP message for a connection with ABR transfer capability. The amount of the adjustment is the fixed portion of the RM cell delay through the network (see Annex B).

9.1.2 Call/connection acceptance

In addition to the procedures of 5.1.7/Q.2931, the CONNECT message shall contain an ATM traffic descriptor information element and ABR setup parameters information elements.

9.2 Call/connection establishment at the destination interface

The procedures of 5.2/Q.2931 shall apply with the following additions.

The network shall send a SETUP message to the called user with an ATM traffic descriptor information element including PCR and MCR, and an ABR setup parameters information element including the ICR, TBE, FRT, RIF and RDF parameters.

Upon receipt of a SETUP message, the called user shall examine the received ATM traffic descriptor and ABR setup parameters. MCR can be negotiated using the procedures described in Recommendation Q.2962 [8], if the corresponding minimum acceptable ATM traffic descriptor value for MCR is included in the SETUP message. No other parameters can be negotiated using the procedures of Recommendation Q.2962. To accept the call/connection, the user may take one of the following actions:

1) If able to provide the indicated PCR and ABR setup parameter values, the user shall accept the call and return a CONNECT message with the same set of parameter values as received in the SETUP message. The handling of the FRT parameter shall be as described in Annex B.

2) If unable to provide the indicated PCR, but able to provide at least the MCR value, the user shall accept the call and return a CONNECT message with the same set of parameter values as in the SETUP message after adjusting the PCR values as needed (the adjusted PCR value shall be greater than or equal to the MCR value).

   When progressing the call, the called user may also adjust the following ABR setup parameters: ICR, TBE, RIF and RDF. The called user may adjust either or both "forward" and "backward" parameters.

   The ABR setup parameters related traffic parameter modifications shall be as specified in Table 7.

If the user is not able to provide a peak cell rate that is greater than or equal to MCR, the user shall reject the call, returning a RELEASE COMPLETE message with Cause No. 47, "resources unavailable, unspecified".

When a SETUP message is received which has one or more parameters of ABR setup parameters information element or MCR parameter absent, the procedures of 5.6.7.2/Q.2931 shall apply.

9.3 Handling of specific error conditions

When the SETUP message is received with an ATM traffic descriptor information element which contains a combination of traffic parameters that is not allowed when ABR is requested (see 8.2.1) the ATM traffic descriptor information element shall be treated as a mandatory information element received with content error (see 5.6.7.2/Q.2931).

10 Signalling procedures at the T_B reference point for interworking with private B-ISDNs

The procedures of clause 9 shall apply with the following additions.

To support symmetrical procedures at the originated T_B reference point, all the parameters in the ABR setup parameters information element and MCR parameters in the ATM traffic descriptor information element shall be included in the SETUP message sent by the user.

When a SETUP message is received by the network which has one or more parameters in the ABR setup parameters information element or MCR parameter in the ATM traffic descriptor information element absent, the receiver shall initiate clearing by sending a RELEASE COMPLETE message with Cause No. 100 "Invalid information element contents".

11 Interworking with other networks

11.1 Interaction with entities which do not support the ABR ATM transfer capability

If an entity which does not support the capabilities described in this Recommendation receives a broadband transfer capability field indicating "ABR" in a SETUP message, it shall follow the procedures described in 5.6.7.2/Q.2931 [2].

11.2 Interworking with N-ISDN

It is not possible to interwork the ABR ATM transfer capability with an N-ISDN entity. The request is rejected by the interworking function.

12 Interactions with supplementary services

The support of the ATM transfer capability covered by this part has no impact on the support of CLIP, CLIR, COLP, COLR, DDI, SUB, UUS, CUG and MSN supplementary services as specified in Recommendations Q.2951.1 [5], Q.2955.1 [10] and Q.2957.1 [6].

13 Parameters and timers

See clause 7/Q.2931. No additional parameters and timers are defined.

14 Dynamic description (SDLs)

See Annex A/Q.2931. No additional SDLs are defined.

Annex A

Valid combinations of traffic-related parameters for the support of ABR transfer capability

This Annex contains the necessary amendments to Recommendation Q.2961.2 [7] for the support of ABR.

Valid combinations of traffic-related parameters in the SETUP message have been added for ABR. Accordingly, add the following as a new part of Table A.1/Q.2961.2.

Broadband bearer capability		
Bearer class	C	X or FR
Broadband transfer capability (value)	12	12
Traffic descriptor for a given direction		
PCR (CLP = 0)		
PCR (CLP = 0 + 1)	S	S
{SCR, MBS} (CLP = 0)		
{SCR, MBS} (CLP = 0 + 1)		
ABR MCR	Note A	Note A
Tagging	N	N
End-to-end timing required	N	N
Requested ATC [4]	ABR	ABR
Implicitly requested QOS when the QOS class is 0	Class 3	Class 3
I.371 ATC that supports the requested ATC	ABR	ABR
I.356 [5] defined QOS class that supports the requested QOS	Class 3	Class 3
NOTE A – Optional in the user-to-network direction. Mandatory in the network-to-user direction and at the T_B reference point.		

Annex B

Handling of the cumulative RM fixed round-trip time parameter

B.1 General

This Annex describes the use of the FRT parameter in the ABR setup parameters information element. The support of the FRT parameter and the procedures described in this Annex are mandatory both for the network and for the user.

The purpose of the FRT is to indicate the time taken by an RM cell to travel from source to the destination and back under condition of no congestion.

B.2 Handling of the cumulative RM fixed round-trip time parameter

The calling user shall include the FRT parameter in the ABR setup parameters information element in the SETUP message.

The FRT parameter in the ABR setup parameters information element shall be set to the calling user's RM cell delay contribution for the forward and backward path of a given VC connection. User's RM cell delay shall not include the calling user user-to-network link propagation delay.

The network shall adjust the cumulative FRT parameter in the ABR setup parameters information element when forwarding a SETUP message for VC connection using the ABR ATM transfer capability. The amount of the adjustment is the fixed portion of the RM cell delay through the network, including the link propagation delay on the calling user and called user access. The adjustment value, expressed in microseconds encoded as an integer, is added to the FRT parameter.

The called user shall adjust the FRT parameter in the ABR setup parameters information element. The amount of the adjustment is the called user's RM cell delay contribution for the forward and backward direction of the VC connection. User's cell delay shall not include the called user's user-to-network link propagation delay.

Appendix I

Instruction indicators

Guidelines for the use of instruction indicators

For messages and information elements defined in Recommendation Q.2931, see Appendix I/Q.2931. With the additional information elements related to ABR call/connection control, the instruction indicator flag should be used as shown in Table I.1.

The following abbreviations have been used in the Table I.1:

Used Follow explicit instructions

Not usedInstruction field not significant

N Network

U User

Table I.1/Q.2961.3 – Use of instruction indicators for the information elements in this Recommendation

Information elements	Flag	Origin	Action indicator
ABR setup parameters	Not used	N & U	

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