



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Q.2961.5

(03/99)

SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – B-ISDN application protocols for
access signalling

**Digital subscriber signalling system No. 2 –
Additional traffic parameters: Additional traffic
parameters for cell delay variation tolerance
indication**

ITU-T Recommendation Q.2961.5

(Previously CCITT Recommendation)

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

| | |
|--|----------------------|
| SIGNALLING IN THE INTERNATIONAL MANUAL SERVICE | Q.1–Q.3 |
| INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC WORKING | Q.4–Q.59 |
| FUNCTIONS AND INFORMATION FLOWS FOR SERVICES IN THE ISDN | Q.60–Q.99 |
| CLAUSES APPLICABLE TO ITU-T STANDARD SYSTEMS | Q.100–Q.119 |
| SPECIFICATIONS OF SIGNALLING SYSTEMS No. 4 AND No. 5 | Q.120–Q.249 |
| SPECIFICATIONS OF SIGNALLING SYSTEM No. 6 | Q.250–Q.309 |
| SPECIFICATIONS OF SIGNALLING SYSTEM R1 | Q.310–Q.399 |
| SPECIFICATIONS OF SIGNALLING SYSTEM R2 | Q.400–Q.499 |
| DIGITAL EXCHANGES | Q.500–Q.599 |
| INTERWORKING OF SIGNALLING SYSTEMS | Q.600–Q.699 |
| SPECIFICATIONS OF SIGNALLING SYSTEM No. 7 | Q.700–Q.849 |
| DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 1 | Q.850–Q.999 |
| PUBLIC LAND MOBILE NETWORK | Q.1000–Q.1099 |
| INTERWORKING WITH SATELLITE MOBILE SYSTEMS | Q.1100–Q.1199 |
| INTELLIGENT NETWORK | Q.1200–Q.1699 |
| SIGNALLING REQUIREMENTS AND PROTOCOLS FOR IMT-2000 | Q.1700–Q.1799 |
| BROADBAND ISDN | Q.2000–Q.2999 |
| General aspects | Q.2000–Q.2099 |
| Signalling ATM adaptation layer (SAAL) | Q.2100–Q.2199 |
| Signalling network protocols | Q.2200–Q.2299 |
| Common aspects of B-ISDN application protocols for access signalling and network signalling and interworking | Q.2600–Q.2699 |
| B-ISDN application protocols for the network signalling | Q.2700–Q.2899 |
| B-ISDN application protocols for access signalling | Q.2900–Q.2999 |

For further details, please refer to ITU-T List of Recommendations.

ITU-T RECOMMENDATION Q.2961.5

DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 2 – ADDITIONAL TRAFFIC PARAMETERS: ADDITIONAL TRAFFIC PARAMETERS FOR CELL DELAY VARIATION TOLERANCE INDICATION

Summary

Recommendation Q.2961.5 belongs to the DSS2 family of ITU-T Recommendations and specifies extensions to Recommendations Q.2931, Q.2961.1, Q.2961.2, Q.2961.3, Q.2961.4, Q.2961.6 and Q.2934 to specify the additional DSS2 traffic-related parameters, formats, protocol procedures and functions needed to support the user-to-network and network-to-user indication of Cell Delay Variation Tolerances at call/connection establishment time, consistently with the traffic management requirements and features defined in Recommendation I.371.

Source

ITU-T Recommendation Q.2961.5 was prepared by ITU-T Study Group 11 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 15th of March 1999.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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 term *recognized operating agency (ROA)* includes any individual, company, corporation or governmental organization that operates a public correspondence service. The terms *Administration*, *ROA* and *public correspondence* are defined in the *Constitution of the ITU (Geneva, 1992)*.

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.

© ITU 1999

All rights reserved. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the ITU.

CONTENTS

| | Page |
|------|--|
| 1 | Scope..... 1 |
| 2 | References..... 1 |
| 3 | Definitions 2 |
| 4 | Abbreviations..... 3 |
| 5 | Description..... 3 |
| 6 | Operational requirements..... 4 |
| 6.1 | Provision and withdrawal 4 |
| 6.2 | Requirements at the originating network side 4 |
| 6.3 | Requirements at the terminating network side..... 4 |
| 7 | Primitive and state definitions 4 |
| 7.1 | Primitive definitions 4 |
| 7.2 | Call states..... 4 |
| 8 | Coding requirements..... 4 |
| 8.1 | Messages 4 |
| | 8.1.1 CONNECT 4 |
| | 8.1.2 SETUP..... 5 |
| 8.2 | Information elements 5 |
| | 8.2.1 CDVT descriptor 5 |
| 9 | Signalling procedures at the coincident S_B and T_B reference point..... 7 |
| 9.1 | Call/Connection establishment at the originating interface 7 |
| | 9.1.1 Traffic Parameters selection procedures..... 7 |
| | 9.1.2 Call/Connection acceptance..... 8 |
| 9.2 | Call/Connection establishment at the destination interface 9 |
| | 9.2.1 Traffic parameter selection procedures..... 9 |
| | 9.2.2 Call/Connection acceptance..... 9 |
| 10 | Signalling procedures at the T_B reference point for interworking with private B-ISDNs..... 10 |
| 11 | Interworking with other networks..... 10 |
| 11.1 | Interaction with entities which do not support the explicit indication of CDVT..... 10 |
| 11.2 | Interworking with N-ISDN 11 |
| 12 | Interactions with supplementary services 11 |
| 13 | Interactions with traffic parameter negotiation at connection establishment..... 11 |
| 14 | Interactions with connection modification..... 11 |

| | Page |
|--|-------------|
| 15 Timers | 11 |
| 16 Dynamic description (SDLs) | 11 |
| Annex A – Applicability of the various CDVT parameters to the ATM transfer capabilities. | 12 |
| Appendix I – Guidelines for the setting of the instruction indicator..... | 13 |

Recommendation Q.2961.5

DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 2 – ADDITIONAL TRAFFIC PARAMETERS: ADDITIONAL TRAFFIC PARAMETERS FOR CELL DELAY VARIATION TOLERANCE INDICATION

(Geneva, 1999)

1 Scope

The Q.2961-series Recommendations 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 (DSS2). This Recommendation defines the DSS2 protocol procedures, formats and functions needed to support the identified ATM traffic-related additional capabilities.

This Recommendation is part of the DSS2 family of ITU-T Recommendations and specifies extensions to Recommendation Q.2931. It 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 signalling capabilities to support the cell delay variation tolerance (CDVT) indications at call/connection establishment time for Peak Cell Rate with $CLP = 0 + 1$, for the Sustainable Cell Rate with $CLP = 0 + 1$, for the Sustainable Cell Rate with $CLP = 0$ and for the Resource Management peak cell rate, consistently with the traffic management features and requirements defined in Recommendation I.371 [4].

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 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 F.811 (1996), *Broadband connection-oriented bearer service*.
- [4] ITU-T Recommendation I.371 (1996), *Traffic control and congestion control in B-ISDN*.
- [5] ITU-T Recommendation I.150 (1999), *B-ISDN ATM Functional Characteristics*.
- [6] ITU-T Recommendation I.361 (1999), *B-ISDN ATM layer specification*.
- [7] ITU-T Recommendation Q.2951.x-series (1995), *Stage 3 description for number identification supplementary services using B-ISDN digital subscriber signalling system No. 2 (DSS 2) – Basic Call*.
- [8] 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)*.

- [9] 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).
- [10] ITU-T Recommendation I.610 (1999), *B-ISDN operation and maintenance procedures*.
- [11] ITU-T Recommendation Q.2961.1 (1995), *Digital subscriber signalling system No. 2 – Additional traffic parameters: Additional signalling capabilities to support traffic parameters for the tagging option and the sustainable cell rate parameter set*.
- [12] 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 element*.
- [13] ITU-T Recommendation Q.2961.3 (1997), *Digital subscriber signalling system No. 2 – Additional traffic parameters: Signalling capabilities to support traffic parameters for the available bit rate (ABR) ATM transfer capability*.
- [14] ITU-T Recommendation Q.2961.4 (1997), *Digital subscriber signalling system No. 2 – Additional traffic parameters: Signalling capabilities to support traffic parameters for the ATM Block Transfer (ABT) ATM transfer capability*.
- [15] ITU-T Recommendation Q.2961.6 (1998), *Digital subscriber signalling system No. 2 – Additional traffic parameters: Additional signalling procedures for the support of the SBR 2 and SBR 3 ATM transfer capabilities*.
- [16] ITU-T Recommendation Q.2962 (1998), *Digital subscriber signalling system No. 2 – Connection characteristics negotiation during call/connection establishment phase*.
- [17] ITU-T Recommendation Q.2963.1 (1996), *Digital Subscriber Signalling System No. 2 – Connection modification: Peak cell rate modification by the connection owner*.
- [18] ITU-T Recommendation Q.2963.2 (1997), *Digital Subscriber Signalling System No. 2 – Connection modification: Modification procedures for sustainable cell rate parameters*.
- [19] ITU-T Recommendation Q.2963.3 (1998), *Digital Subscriber Signalling System No. 2 – Connection modification ATM: Traffic descriptor modification with negotiation by the connection owner*.
- [20] ITU-T Recommendation Q.2934 (1998), *Digital Subscriber Signalling System No. 2 – Connection modification: Switched virtual path capability*.

3 Definitions

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

3.1 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 [4]).

3.2 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 [4].

3.3 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.

3.4 resource management cells: Cells used to manage (renegotiate and modify) traffic parameters associated to an established connection.

3.5 cell delay variation tolerance: Upper bound of the tolerance admitted for the time interval between cells pertaining to a given cell flow (e.g. user data, end-to-end OAM, Resource Management flows).

3.6 default τ_{MAX} : Default maximum cell delay variation that can be tolerated on a given cell stream. This value is specific at each interface. In particular it depends on whether or not a traffic shaping function is available at the receiving and transmitting sides of ATM switching nodes at either side of the user-network interface (see Recommendation I.371 [4]).

4 Abbreviations

The abbreviations in Annex J/Q.2931 [2] apply. In addition, this Recommendation uses the following abbreviations:

| | |
|--------------|--|
| ABR | Available Bit Rate ATM layer transfer capability (see Recommendation I.371 [4]). |
| ABT-DT | ATM Block Transfer with Delayed Transmission (see Recommendation I.371 [4]). |
| ABT-IT | ATM Block Transfer with Immediate Transmission ATM layer transfer capability (see Recommendation I.371 [4]). |
| CDVT | Cell Delay Variation Tolerance (see Recommendation I.371 [4]). Also noted τ . |
| DBR | Deterministic Bit Rate ATM layer transfer capability (see Recommendation I.371 [4]). |
| OAM | Operations, Administration and Maintenance (see Recommendation I.610 [10]). |
| RM | ATM Resource Management cells (see Recommendation I.371 [4]). |
| SBR | Statistical Bit Rate ATM transfer capability (see Recommendation I.371 [4]). |
| τ_{MAX} | Maximum CDVT value |

5 Description

This Recommendation specifies the signalling of CDVT traffic-related parameters beyond the ones already specified by Recommendations Q.2931 [2], Q.2961.1 [11], Q.2961.2 [12], Q.2961.3 [13], Q.2961.4 [14], Q.2961.6 [15] and Q.2934 [20]. In particular, the following additional capabilities are specified:

- indication of the CDVT, $\tau_{PCR}(0 + 1)$, relating to the Peak Cell Rate with $CLP = 0 + 1$;
- indication of the CDVT, $\tau_{SCR}(0)$, relating the Sustainable Cell Rate with $CLP = 0$;
- indication of the CDVT, $\tau_{SCR}(0 + 1)$, relating to the Sustainable Cell Rate with $CLP = 0 + 1$;
- indication of the CDVT, $\tau_{PCR}(RM)$, relating to the Resource Management peak cell rate.

CDVT indication is used to signal the CDVT values to be used for a connection between the entities involved. At the UNI the calling user may request CDVT values applicable for the forward direction and the maximum acceptable CDVT value for the backward direction. The received CDVT values are handled by the network and conveyed to the called user. The network(s) may use the signalled CDVT values for policing and decisions regarding resource allocation and shaping. During this process the CDVT values will be adjusted to the specific conditions of the network(s) the connection is routed through. At the destination UNI the CDVT values applicable are sent to the called user. If received in the SETUP message, the called user responds with the backward CDVT values to be used for the backward direction. These values are handled by the network and conveyed towards the calling user and may be used by the network(s) to optimize the resources allocated for the backward direction. During this process the backward CDVT values will be adjusted to the specific conditions

of the network(s) involved. For details of traffic management regarding interactions between CDVT and shaping or policing, refer to Recommendation I.371 [4].

6 Operational requirements

6.1 Provision and withdrawal

The signalling of per call/connection CDVT parameter values as specified in this Recommendation shall be provided, independently, to the calling user and/or to the called user after prior arrangement with the service provider. If such a prior arrangement does not exist, appropriate default τ_{MAX} values shall be assumed bilaterally, based on the rules specified in Recommendation I.371 [4].

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

See clause 8/Q.2931. No additional primitives are defined.

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 per call/connection CDVT indications 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 3-4/Q.2931.

Table 1/Q.2961.5 – CONNECT message additional content

| Message type: CONNECT Significance: Global Direction: Both | | | | |
|---|-----------|-----------|----------|--------|
| Information element | Reference | Direction | Type | Length |
| CDVT descriptor | 8.2.1 | Both | O (Note) | 4-22 |
| NOTE – Included to indicate the maximum value for the relevant backward CDVT parameters, i.e. those CDVT parameters corresponding to the traffic parameters actually included in the ATM traffic descriptor in the SETUP message. | | | | |

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 3-8/Q.2931.

Table 2/Q.2961.5 – SETUP message additional content

| Message type: SETUP Significance: Global Direction: Both | | | | |
|---|-----------|-----------|----------|--------|
| Information element | Reference | Direction | Type | Length |
| CDVT descriptor | 8.2.1 | Both | O (Note) | 4-22 |
| NOTE – Included to indicate the maximum value of the relevant forward CDVT parameters and the maximum values acceptable for the relevant backward CDVT parameters, i.e. those CDVT parameters corresponding to the traffic parameters actually included in the ATM traffic descriptor in the SETUP message. | | | | |

8.2 Information elements

See clause 4/Q.2931. The CDVT descriptor information element used to indicate the CDVT values on a per call/connection basis is defined in this subclause.

8.2.1 CDVT descriptor

The CDVT descriptor information element is specified as shown in Figure 1 and in Table 3 below. The maximum length of this information element is 22 octets.

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Octets | |
|--|--------------------|------|----------------------|----------------------|---|---|---|----------------|---|
| CDVT descriptor information element identifier | | | | | | | | | |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | |
| 1 ext. | Coding standard | | IE Instruction field | | | | | | 2 |
| | | Flag | Res. | IE Action indicators | | | | | 3 |
| Length of the CDVT descriptor contents | | | | | | | | 4 | |
| Forward $\tau_{PCR}(0+1)$ identifier | | | | | | | | 5* | |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | | |
| ----- Forward $\tau_{PCR}(0+1)$ value | | | | | | | | 5.1* 5.2* | |
| Backward $\tau_{PCR}(0+1)$ identifier | | | | | | | | 6* | |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | | |
| ----- Backward $\tau_{PCR}(0+1)$ value | | | | | | | | 6.1* 6.2* | |
| Forward $\tau_{SCR}(0)$ identifier | | | | | | | | 7* | |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | | |
| ----- Forward $\tau_{SCR}(0)$ value | | | | | | | | 7.1* 7.2* | |
| Backward $\tau_{SCR}(0)$ identifier | | | | | | | | 8* | |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | | |
| ----- Backward $\tau_{SCR}(0)$ value | | | | | | | | 8.1* 8.2* | |
| Forward $\tau_{SCR}(0+1)$ identifier | | | | | | | | 9* | |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | | |
| ----- Forward $\tau_{SCR}(0+1)$ value | | | | | | | | 9.1* 9.2* | |
| Backward $\tau_{SCR}(0+1)$ identifier | | | | | | | | 10* | |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | | |
| ----- Backward $\tau_{SCR}(0+1)$ value | | | | | | | | 10.1* 10.2* | |
| Forward $\tau_{PCR}(RM)$ identifier | | | | | | | | 11* | |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| ----- Forward $\tau_{PCR}(RM)$ value | | | | | | | | 11.1* 11.2* | |
| Backward $\tau_{PCR}(RM)$ identifier | | | | | | | | 12 | |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | | |
| ----- Backward $\tau_{PCR}(RM)$ value | | | | | | | | 12.1* 12.2* | |

NOTE – All the parameters are position independent. "Forward " indicates the direction from the calling user to the called user and "Backward" refers to the direction from the called user to the calling user.

Figure 1/Q.2961.5 – CDVT descriptor information element

Table 3/Q.2961.5 – Content of the CDVT descriptor information element

Forward/backward CDVT value (octets 5.1-5.2 through 12.1-12.2 respectively):
 The forward and backward CDVT parameter value is coded by octet x.1 giving in pure 5-bits integer representation the exponent e (values 0 to 31) and by octet x.2 giving in pure 5-bits integer representation the mantissa w (values 0 to 31) used to point to the actual CDVT value expressed in seconds (see 2.4.1.3/I.371 [4]).

The possible (optional) inclusion of individual CDVT parameters in the SETUP and the CONNECT messages is determined by the actual ATM transfer capability used for the call/connection. The individual CDVT parameters applicable for each ATM transfer capability are identified in Annex A.

9 Signalling procedures at the coincident S_B and T_B reference point

Depending on the ATM transfer capability requested for the call/connection (see Recommendation Q.2961.2 [11]), procedures for basic call/connection control as defined in the following Recommendations, including Recommendation Q.2961.2 [11] for the identification of the ATC used, shall apply:

- Q.2931 [2] for the DBR ATM transfer capability, and Q.2931 complemented by:
- Q.2961.1 [11], for the SBR ATM transfer capability;
- Q.2961.3 [13], for the ABR ATM transfer capability;
- Q.2961.4 [14], for the ABT ATM transfer capability.
- Q.2961.6 [15] for the SBR2/SBR3 transfer capability.

Only additional procedures to support per call/connection CDVT allocation, through the handling of the CDVT descriptor information element, are described in the following subclauses.

9.1 Call/Connection establishment at the originating interface

9.1.1 Traffic Parameters selection procedures

The calling user may indicate forward and backward CDVT values by including the relevant CDVT parameters in the CDVT descriptor information element in the SETUP message. The network shall interpret the backward CDVT parameter values included in the SETUP message as the maximum acceptable cell delay variation tolerance for the cell flow in the backward direction.

The possible inclusion of individual CDVT parameters in the SETUP message by the user is determined by the ATM transfer capability used for the call/connection. The individual CDVT parameters applicable for each ATM transfer capability are identified in Annex A.

A forward or backward CDVT parameter may be included in the SETUP message only if the related traffic parameter is included (e.g. for the SBR ATM transfer capability, if the forward sustainable cell rate ($CLP = 0 + 1$) parameter is included in the ATM traffic descriptor information element of the SETUP message then the forward sustainable CDVT ($CLP = 0 + 1$) is valid in the CDVT descriptor information element in the SETUP message).

If non-associated signalling is used, the SETUP message shall include the Connection identifier information element, i.e. case c) of 5.1.2.2/Q.2931 [2] is not applicable.

If the network determines that the CDVT descriptor information element is not present or does not contain a complete set of individual forward and backward CDVT parameters applicable to the indicated ATC (see Annex A), the network shall act as it received a default τ_{MAX} value for each of the individual missing forward and backward CDVT parameters.

When the network is able to provide resources complying with the traffic parameter values specified in the ATM traffic descriptor information element and supports the CDVT parameter values, the network shall progress the call towards the called user. The forward and backward CDVT parameter values are set sequentially and adjusted along the path of the connection, taking into account the cell delay variation incurred in each network.

If the network determines that the CDVT descriptor information element contains a set of individual CDVT parameters not compatible with the indicated ATM transfer capability (see Annex A), the

network shall release the call by returning a RELEASE COMPLETE message with cause No. 73, "Unsupported combination of traffic parameters".

If the network is not able to support one of the indicated CDVT parameter values, the network shall return a RELEASE COMPLETE message with cause No. 37, "User cell rate not available".

If the calling user has not subscribed to CDVT indication and the network receives a CDVT descriptor information element in the SETUP message, the network shall discard the information element without returning a STATUS message, and use default values.

9.1.2 Call/Connection acceptance

The possible inclusion of individual CDVT parameters in the CONNECT message by the network is determined by the ATM transfer capability used for the connection. The individual CDVT parameters applicable for each ATM transfer capability are specified in Annex A.

A backward CDVT parameter may be included in the CONNECT message only if the related traffic parameter was included in the SETUP message (e.g. for the SBR transfer capability, if the backward sustainable cell rate (CLP = 0 + 1) parameter was included in the ATM traffic descriptor information element of the received SETUP message then the backward sustainable cell rate CDVT(CLP = 0 + 1) is applicable in the CDVT descriptor information element in the CONNECT message).

If the CDVT descriptor information element included backward CDVT parameters in the SETUP message, the network shall include the same parameters in the CONNECT message, with an equal or smaller value (e.g. if transmitted traffic shaping is performed, as a network option).

In addition, the network may include in the CONNECT message backward CDVT parameter values for the traffic parameters for which no corresponding backward CDVT parameter values were indicated in the SETUP message. In this case, the backward CDVT parameter values indicated in the CONNECT message shall be less than the default τ_{MAX} value.

No forward CDVT parameter shall be included in the CONNECT message.

If the calling user determines that the backward CDVT parameters it included in the SETUP message are not present in the received CONNECT message, it shall use the lesser of the default value and the maximum backward CDVT value that it originally included in the SETUP message (i.e. $CDVT_b = \min\{CDVT_{default}, CDVT_{b(max)}\}$)

If the calling user determines that the CDVT descriptor information element contains a set of individual CDVT parameters not compatible with the indicated ATM transfer capability (see Annex A), the calling user shall release the call by returning a RELEASE message with cause No. 73, "Unsupported combination of traffic parameters".

If the calling user determines that the CDVT descriptor information element in the CONNECT message contains forward CDVT parameters, the calling user shall ignore these parameters, without returning a STATUS message.

If the calling user determines that a backward CDVT parameter value received in the CONNECT message is inconsistent with the corresponding value it indicated in the SETUP message (e.g. where the backward CDVT parameter value indicated in the CONNECT message is greater than the value indicated in the SETUP message), the calling user shall release the call by returning a RELEASE message with cause No. 37, "User cell rate not available".

If the calling user determines that for a specific traffic parameter for which no corresponding backward CDVT parameter was indicated in the SETUP message, the backward CDVT parameter value received in the CONNECT message is inconsistent with the default τ_{MAX} value (e.g. where the backward CDVT parameter value indicated in the CONNECT message is greater than the default

τ MAX value), the calling user shall release the call by returning a RELEASE message with cause No. 37, "User cell rate not available".

If the calling user has not subscribed to CDVT indication, the network shall not include a CDVT descriptor information element in the CONNECT message.

9.2 Call/Connection establishment at the destination interface

9.2.1 Traffic parameter selection procedures

The network shall include a CDVT descriptor information element in the SETUP message if the called user has subscribed to CDVT indication. If the called user has not subscribed to CDVT indication, no CDVT descriptor information element shall be delivered to the called user and the network shall base its resource allocation on default τ MAX values.

The network may indicate forward and backward CDVT values by including the CDVT parameters in the CDVT descriptor information element in the SETUP message. The calling user shall interpret the backward CDVT parameter values in the CDVT descriptor information element as maximum acceptable cell delay variation tolerance for the cell flow in the backward direction.

The possible inclusion of individual CDVT parameters in the SETUP message by the network is determined by the ATM transfer capability used for the call/connection. The individual CDVT parameters applicable for each ATM transfer capability are identified in Annex A.

A forward or backward CDVT parameter may be included in the SETUP message only if the related traffic parameter is included (e.g. for the SBR ATM transfer capability, if the forward sustainable cell rate (CLP = 0 + 1) parameter is included in the ATM traffic descriptor information element of the SETUP message, then the forward sustainable CDVT (CLP = 0 + 1) is applicable in the CDVT descriptor information element in the SETUP message). If non-associated signalling is used, the SETUP message shall include the Connection identifier information element, i.e. case c) of 5.2.3.2/Q.2931 [2] is not applicable.

If the called user determines that the CDVT descriptor information element is not present or does not contain a complete set of individual forward and backward CDVT parameters applicable to the indicated ATM transfer capability (see Annex A), the called user shall act as if it received a default τ MAX value for each of the individual missing forward and backward CDVT parameters.

If the called user determines that the CDVT descriptor information element contains a set of individual CDVT parameters not compatible with the indicated ATM transfer capability (see Annex A), the called user shall release the call by returning a RELEASE COMPLETE message with cause No. 73, "Unsupported combination of traffic parameters".

If the called user is not able to support one of the indicated forward and backward CDVT parameter values, the called user shall release the call by returning a RELEASE COMPLETE message with cause No. 37, "User cell rate not available".

9.2.2 Call/Connection acceptance

The possible inclusion of individual CDVT parameters in the CONNECT message by the called user is determined by the ATM transfer capability used for the call/connection. The individual CDVT parameters applicable for each ATM transfer capability are identified in Annex A.

A backward CDVT parameter may be included in the CONNECT message only if the related traffic parameter was included in the SETUP message (e.g. for the SBR transfer capability, if the backward sustainable cell rate (CLP = 0 + 1) parameter was included in the ATM traffic descriptor information element of the received SETUP message, then the backward sustainable cell rate CDVT (CLP = 0 + 1) parameter is applicable in the CDVT descriptor information element in the CONNECT message).

If the CDVT descriptor information element included backward CDVT parameters in the SETUP message, the called user shall include the same parameters in the CONNECT message with an equal or lesser value (e.g. if transmitted traffic shaping is, optionally, performed by the user).

In addition, the called user may include in the CONNECT message backward CDVT parameter values for the traffic parameters for which no corresponding backward CDVT parameter values were indicated in the SETUP message. In this case, the backward CDVT parameter values indicated in the CONNECT message shall be less than the default τ_{MAX} value.

No forward CDVT parameter shall be included in the CONNECT message.

If the network determines that the backward CDVT parameters it included in the SETUP message are not present in the received CONNECT message, it shall use the lesser of the default value and the maximum backward CDVT value that it originally included in the SETUP message (i.e. $CDVT_b = \min\{CDVT_{default}, CDVT_{b(max)}\}$)

If the network determines that the CDVT descriptor information element contains a set of individual CDVT parameters not compatible with the indicated ATM transfer capability (see Annex A), the network shall release the call by returning a RELEASE message with cause No. 73, "*Unsupported combination of traffic parameters*".

If the network determines that the CDVT descriptor information element in the CONNECT message contains forward CDVT parameters, the network shall ignore these parameters, without returning a STATUS message.

If the network determines that a backward CDVT parameter value received in the CONNECT message is inconsistent with the corresponding value it indicated in the SETUP message (e.g. where the backward CDVT parameter value indicated in the CONNECT message is greater than the value indicated in the SETUP message), the network shall release the call by returning a RELEASE message with cause No. 37, "*User cell rate not available*".

If the network determines that for a specific traffic parameter for which no corresponding backward CDVT parameter was indicated in the SETUP message, the backward CDVT parameter value received in the CONNECT message is inconsistent with the default τ_{MAX} value (e.g. where the backward CDVT parameter value indicated in the CONNECT message is greater than the default τ_{MAX} value), the network shall release the call by returning a RELEASE message with cause No. 37, "*User cell rate not available*".

If the called user has not subscribed to CDVT indication and the network receives a CDVT descriptor information element in the CONNECT message, the network shall discard the information element without returning a STATUS message, and use default values.

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

The signalling procedures defined in clause 9 apply. No specific procedures are defined at the T_B reference point.

11 Interworking with other networks

11.1 Interaction with entities which do not support the explicit indication of CDVT

If an entity which does not support the capabilities described in this Recommendation receives a CDVT descriptor information element in a SETUP or a CONNECT message, it shall follow the error handling procedures described in 5.6, 5.7 and 5.8/Q.2931 [2].

NOTE – The default CDVT values is then applied to the connection.

11.2 Interworking with N-ISDN

It is neither possible nor relevant to interwork the explicit CDVT indication capability with an N-ISDN entity.

12 Interactions with supplementary services

The support of the explicit CDVT indication capabilities covered by this Recommendation has no impact on the support of CLIP, CLIR, COLP, COLR, DDI, SUB, UUS, MSN and CUG supplementary services as specified in Recommendation Q.2951 [7], Q.2955.1 [8] and Q.2957.1 [9].

13 Interactions with traffic parameter negotiation at connection establishment

When one or more than one traffic parameter of a requested connection is negotiated at call/connection establishment, using procedures defined in Recommendation Q.2962 [16], for a connection to which CDVT values other than the default CDVT values are expected or required, the CDVT values indicated shall be unique to the common set or range of traffic parameter values negotiated.

This Recommendation does not define procedures for indicating non-default CDVT values dependent on negotiable traffic parameters.

NOTE – It is recommended that, at the establishment of call/connections with negotiated traffic parameters, the user ensures that the non-default CDVT values indicated are able to comply with the whole range of the related negotiated traffic parameters. Alternatively, in particular if this is not the case or if there are uncertainties, it is recommended to apply default CDVT values for connections for which one or more than one traffic parameter is negotiated.

14 Interactions with connection modification

When one or more than one traffic parameter of a connection is modified, using procedures defined in Recommendations Q.2963.1 [17], Q.2963.2 [18] or Q.2963.3 [19], for a connection to which CDVT values other than the default CDVT values have been indicated and confirmed, the CDVT values allocated at connection establishment time shall be maintained unchanged.

This Recommendation does not define procedures for modifying CDVT parameters relating to modifiable traffic parameters.

NOTE – It is recommended that, at the establishment of modifiable call/connections, the user ensures that the CDVT parameters indicated with a value different from the default ones are able to comply with any value of the related traffic parameters within the range of possible subsequent modifications of the corresponding traffic parameters. Alternatively, in particular if this is not the case or if there are uncertainties, it is recommended to apply default CDVT values for modifiable connections.

15 Timers

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

16 Dynamic description (SDLs)

See Annex A/Q.2931 [2]. No additional SDLs are defined.

ANNEX A

Applicability of the various CDVT parameters to the ATM transfer capabilities

For all the ATM transfer capabilities, the indication CDVT parameters at call/connection establishment time is optional.

As a general rule, a CDVT parameter may be indicated in the CDVT descriptor information element only if the corresponding traffic parameter is included in the ATM traffic descriptor information element.

In addition, the inclusion of the CDVT descriptor information element in the SETUP message does not induce the mandatory indication of the CDVT parameter for all the traffic parameters provided in the ATM traffic descriptor information element.

An appropriate default τ_{MAX} value shall be used for each of the relevant individual CDVT parameters expected but that are missing in the received CDVT descriptor information element.

Table A.1 lists the individual CDVT parameters that are applicable for each of the ATM transfer capability defined in Recommendation I.371 [4].

An "X" in the tables means that the CDVT parameter is valid for and applicable to the corresponding ATM transfer capability.

Table A.1/Q.2961.5 – CDVT parameters and ATM transfer capabilities

| | DBR | SBR | ABR | ABT-DT/ABT-IT |
|--|-----|------------|------------|---------------|
| $\tau_{PCR}(0 + 1)$ (Note 1) | X | X | X (Note 2) | X |
| $\tau_{SCR}(0)$ | | X (Note 3) | | |
| $\tau_{SCR}(0 + 1)$ | | X (Note 3) | | X |
| $\tau_{PCR}(RM)$ | | | | X |
| <p>NOTE 1 – Separate declaration of user-generated OAM traffic characteristics is possible only for the DBR and ABT ATM transfer capabilities, and this separate declaration is anyway a user option. Regardless of whether this option is applied or not, user-generated OAM cells are aggregated with the user-generated data cells in the ATM traffic parameter values declared in the ATM traffic descriptor information element at call/connection set-up time. However, the peak cell rate (CLP = 0 + 1) CDVT parameter, if indicated, relates exclusively to the user-generated cell flow.</p> <p>NOTE 2 – For the ABR ATM transfer capability, the forward and backward CDVT (CLP = 0 + 1) parameters values $\tau_{PCR}(0 + 1)$ apply to the cell delay variation tolerance value $\tau_1(\tau_{SCR})$ associated to the Allowed Cell Rate (ACR) which is used in the conformance definition of a connection providing the ABR ATM transfer capability (see Recommendation I.371 [4]). No cell delay variation tolerance is signalled for the minimum cell rate and peak cell rate traffic parameters even though they are included in the ATM traffic descriptor information element.</p> <p>NOTE 3 – There are three configurations for the SBR ATM transfer capability ([4]). Depending on the SBR configuration, either the sustainable cell rate (CLP = 0 + 1) parameter for SBR1, or the sustainable cell rate (CLP = 0) parameter for SBR2/SBR3, is indicated in the ATM traffic descriptor information element, and thus only the related CDVT parameter is applicable.</p> | | | | |

APPENDIX I

Guidelines for the setting of the instruction indicator

This appendix provides guidelines for the setting of the instruction indicator field in the CDVT descriptor information element. An implementation may choose to set the Instruction indicator differently, depending on possible specific requirements.

The recommended setting of the Instruction indicator in the CDVT descriptor information element is as follows (see Table I.1):

Flag: "Ignore explicit instructions"

Action indicator: "not significant".

For messages and information elements defined in Recommendation Q.2931, see Appendix I/Q.2931 [2].

Table I.1/Q.2961.5 – Recommended use of the instruction indicator for the CDVT descriptor information element

| Information elements | Flag | Origin | Action indicator |
|----------------------|--|--------|------------------|
| CDVT descriptor | Not used | N & U | Not significant |
| Used | Follow explicit instructions (in action indicator field) | | |
| Not used | Action indicator field not significant | | |
| N | Network | | |
| U | User | | |

ITU-T RECOMMENDATIONS SERIES

- Series A Organization of the work of the ITU-T
- Series B Means of expression: definitions, symbols, classification
- Series C General telecommunication statistics
- Series D General tariff principles
- Series E Overall network operation, telephone service, service operation and human factors
- Series F Non-telephone telecommunication services
- Series G Transmission systems and media, digital systems and networks
- Series H Audiovisual and multimedia systems
- Series I Integrated services digital network
- Series J Transmission of television, sound programme and other multimedia signals
- Series K Protection against interference
- Series L Construction, installation and protection of cables and other elements of outside plant
- Series M TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
- Series N Maintenance: international sound programme and television transmission circuits
- Series O Specifications of measuring equipment
- Series P Telephone transmission quality, telephone installations, local line networks
- Series Q Switching and signalling**
- Series R Telegraph transmission
- Series S Telegraph services terminal equipment
- Series T Terminals for telematic services
- Series U Telegraph switching
- Series V Data communication over the telephone network
- Series X Data networks and open system communications
- Series Y Global information infrastructure and Internet protocol aspects
- Series Z Languages and general software aspects for telecommunication systems