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SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – B-ISDN application protocols for the
network signalling

**B-ISDN User Part – Support of cell delay
variation tolerance indication**

ITU-T Recommendation Q.2723.5
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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.1999
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.

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ITU-T RECOMMENDATION Q.2723.5

B-ISDN USER PART – SUPPORT OF CELL DELAY VARIATION TOLERANCE INDICATION

Summary

This Recommendation specifies extensions to the Signalling System No. 7 Broadband ISDN User Part to support the Cell Delay Variation Tolerance indication at call/connection establishment. It is consistent with the traffic management requirements and ATM transfer capability features defined in Recommendation I.371.

Source

ITU-T Recommendation Q.2723.5 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.

Keywords

B-ISDN User Part, Cell Delay Variation Tolerance Indication

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CONTENTS

	Page
1 Scope.....	1
2 References.....	1
3 Definitions	2
4 Abbreviations.....	2
5 B-ISDN User Part parameters and messages.....	3
5.1 Parameters.....	3
5.1.1 CDVT	3
5.2 Messages.....	3
6 Call Control, Application Process Functions.....	3
6.1 Connection set-up	5
6.1.1 Assigning exchange.....	5
6.1.2 Non-assigning exchange.....	6
6.2 Answer.....	7
6.2.1 Assigning exchange.....	7
6.2.2 Non-assigning exchange.....	7
6.3 Call Control primitive contents between SACF and Application Process	8
7 SACF	8
7.1 Outgoing messages	8
7.2 Incoming messages	8
7.3 Primitives interface between BCC ASE and SACF	9
8 BCC ASE descriptions.....	9
9 CC ASE descriptions	9
10 Interworking.....	9
10.1 Interworking with nodes which do not support the procedures described in this Recommendation	9
10.2 Interworking with DSS2	9
11 Interactions with other capabilities	10
11.1 Interactions with traffic parameter negotiation at connection establishment.....	10
11.2 Interactions with connection modification.....	10
Appendix I – Setting of instruction indicators	10
Appendix II	11

Superseded by a more recent version

Recommendation Q.2723.5

B-ISDN USER PART – SUPPORT OF CELL DELAY VARIATION TOLERANCE INDICATION

(Geneva, 1999)

1 Scope

This Recommendation specifies extensions to Broadband ISDN User Part protocol to support the Cell Delay Variation Tolerance indication as defined in Recommendation I.371 [1]. These specifications describe the additional traffic parameters and procedures to be provided beyond the ones already specified in Recommendations Q.2764 [2] and Q.2723.1 [3].

It defines:

- new message and parameter coding needed;
- additional primitives and primitive parameters needed to model the new capabilities according to the specification model for B-ISUP defined in Recommendation Q.2764;
- Application Procedure enhancements;
- ASE description enhancements.

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.371 (1996), *Traffic control and congestion control in B-ISDN*.
- [2] ITU-T Recommendation Q.2764 (1995), *Signalling System No. 7 B-ISDN User Part (B-ISUP) – Basic call procedures*.
- [3] ITU-T Recommendation Q.2723.1 (1996), *B-ISDN User Part – Support of additional traffic parameters for sustainable cell rate and quality of service*.
- [4] ITU-T Recommendation Q.2723.2 (1997), *Extensions to the B-ISDN User Part – Support of ATM transfer capability in the broadband bearer capability parameter*.
- [5] ITU-T Recommendation Q.2723.3 (1997), *Extensions to the B-ISDN User Part – Signalling capabilities to support traffic parameters for the available bit rate (ABR)*.
- [6] ITU-T Recommendation Q.2723.4 (1997), *Extensions to the B-ISDN User Part – Signalling capabilities to support traffic parameters for the ATM block transfer (ABT)*.
- [7] ITU-T Recommendation Q.2723.6 (1998), *Extensions to the Signalling System No. 7 B-ISDN User Part – Signalling capabilities to support the indication of the Statistical Bit Rate configuration 2 (SBR 2) and 3 (SBR 3) ATM transfer capabilities*.
- [8] ITU-T Recommendation Q.2961.5 (1999), *Digital Subscriber Signalling System No. 2 – Additional traffic parameters: DSS2 additional traffic parameters for cell delay variation tolerance indication*.

Superseded by a more recent version

- [9] ITU-T Recommendation Q.2725.1 (1998), *B-ISDN User Part – Support of negotiation during connection setup.*
- [10] ITU-T Recommendation Q.2725.2 (1996), *B-ISDN User Part – Modification procedures.*
- [11] ITU-T Recommendation Q.2725.3 (1997), *Extensions to the B-ISDN User Part – Modification procedures for sustainable cell rate parameters.*
- [12] ITU-T Recommendation Q.2725.4 (1998), *Extensions to the signalling system No. 7 B-ISDN User Part – Modification procedures with negotiation.*
- [13] ITU-T Recommendation Q.2650 (1995), *Interworking between Signalling System No. 7 Broadband ISDN User Part (B-ISUP) and Digital Subscriber Signalling System No. 2 (DSS 2).*

3 Definitions

For further study.

4 Abbreviations

This Recommendation uses the following abbreviations:

ABR	Available Bit Rate
ABT-DT	ATM Block Transfer with Delayed Transmission
ABT-IT	ATM Block Transfer with Immediate Transmission
ANM	Answer Message
AP	Application Process
ASE	Application Service Element
ATC	ATM layer Transfer Capability
CDVT	Cell Delay Variation Tolerance
CDVT _b	the backwards CDVT value
CDVT _{b(MAX)}	the maximum allowed CDVT value
CDVT _{default}	the default CDVT value
DBR	Deterministic Bit Rate
IAM	Initial Address Message
MBS	Maximum Burst Size
NPC	Network Parameter Control
PCR	Peak Cell Rate
QoS	Quality of Service
RM	Resource Management
SACF	Single Association Control Function
SBR	Statistical Bit Rate
SCR	Sustainable Cell Rate
VPCI	Virtual Path Connection Identifier

5 B-ISDN User Part parameters and messages

5.1 Parameters

The following parameter is used to support CDVT indication.

5.1.1 CDVT

Information sent in either direction to determine the upper bound of the tolerance admitted for the time interval between cells pertaining to a given cell flow.

This parameter specifies the CDVT value supported locally for the connection. The parameter code is 0111 1110. The format of this parameter is shown in Figure 1.

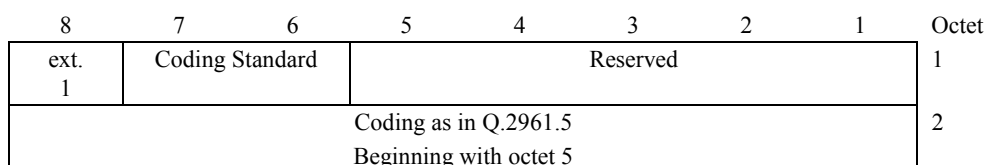


Figure 1/Q.2723.5 – CDVT parameter field

The forward CDVT value included in the IAM and the backwards CDVT value included in the ANM shall be interpreted as the value applicable for the cell flow in the respective direction.

The backward CDVT value included in the IAM shall be interpreted as maximum allowable value for the cell flow in backward direction.

5.2 Messages

The following parameters (see Tables 1 and 2) are carried by IAM and ANM:

Table 1/Q.2723.5 – Additional traffic parameters to be included in IAM

IAM
CDVT

Table 2/Q.2723.5 – Additional traffic parameters to be included in ANM

ANM
CDVT

6 Call Control, Application Process Functions

The procedures for call/connection control as defined in the following Recommendations shall apply:

- Q.2764 [2];
- Q.2723.1 [3];
- Q.2723.2 [4];
- Q.2723.3 [5];

Superseded by a more recent version

- Q.2723.4 [6];
- Q.2723.6 [7].

Only additional procedures to handle the CDVT indication parameter are described.

The possible inclusion of individual CDVT values in the Set_Up request/indication primitives are determined by the ATM Transfer Capability of the call/connection. The allowed individual CDVT values for each ATM Transfer capability are specified in Recommendation Q.2961.5 [8].

If the Set_Up indication primitive contains combinations of CDVT values which are not allowed for the requested ATC, the exchange shall release the connection with Cause #73, "Unsupported combination of traffic parameters".

The CDVT values which are applicable to a connection at an output/input port may be derived as a function of the CDVT values at the input/output port with other parameters like:

- Resource Management/Connection Admission Control characteristics.
- Resource Management status (e.g. traffic load) of the outgoing/incoming link.
- Requested cell rate values.
- Input and/or output traffic shaping characteristics.
- etc.

The support of this function is optional and is implementation dependent (for more information on traffic management see Recommendation I.371 [1]).

In some cases (see next subclauses) however, Resource Management based calculations cannot be done without taking into account other criteria to determine the output/input CDVT (e.g. determination of worst case values or upper bounds (τ_{MAX}) in case of shaping being applied).

Default delta CDVT values are applied to each VPCI, which shall be known at both ends of the VPCI. The default delta CDVT values are representative of the CDVT values to be taken into account when the assigning exchange has received a Set_Up indication primitive from the preceding exchange. When an assigning exchange receives a Set_Up indication primitive from the preceding exchange, the CDVT values received have not taken into account the effect of the link between the two exchanges. The default delta CDVT values will then be taken into account for subsequent processing of CDVT values and in calculations dependent upon the CDVT values within the assigning exchange.

When no information is available to determine the CDVT value, it is then said to be set to "default".

NOTE – The default τ_{MAX} value is network specific.

If no CDVT parameter is received in the Set_Up request primitive, the default values shall be assumed.

If no CDVT parameter is received in the answer indication primitive, for the backward CDVT the minimum of the default value and the received maximum backward CDVT value shall be assumed ($CDVT_b = \text{Min}\{ CDVT_{\text{default}}, CDVT_{b(MAX)} \}$). The maximum backwards CDVT value for that interface is the backwards CDVT value included in the Set_Up request primitive. If necessary, to comply with CDVT requirements, traffic shaping may be applied.

The procedures which are specified in the following subclauses are illustrated in Figure II.1.

6.1 Connection set-up

6.1.1 Assigning exchange

6.1.1.1 Sending of Set_Up request primitive

An assigning exchange shall perform the following actions in addition to the procedures in Recommendation Q.2764 [2]:

The exchange shall determine the forward CDVT values which are applicable at the output port based on the forward CDVT values received in a Set_Up indication primitive from a preceding exchange or from the calling party or from the assumed default values. This may be achieved using resource management-based calculations (see clause 6).¹

The exchange shall determine the maximum backward CDVT values it can handle and that can match the maximum backward CDVT values received from the preceding exchange or from the calling party or that can match the assumed default values.²

Resource allocation in the forward/backward direction shall take these CDVT into account.

If resource allocation fails because the CDVT requirements cannot be met, the connection shall be released according to the procedures specified in 2.3.2/Q.2764 [2], "Lack of resources at outgoing side", with Cause #37, "User cell rate not available".

The locally updated CDVT values shall be included in the Set_Up request primitive issued towards the succeeding exchange or indicated to the called party.

An outgoing international exchange may reduce the maximum backward CDVT values in conformance with the maximum CDVT allowed by the NPC function.

6.1.1.2 Receipt of Set_Up indication primitive

An assigning exchange shall perform the following actions in addition to the procedures in Recommendation Q.2764 [2]:

Resource allocation in forward direction shall be done using the forward CDVT values received in the Set_Up indication primitive, or from the calling party, and the default delta forward CDVT values for the assigned VPCI, or using the assumed default values. Resource allocation in backward direction shall be done using the maximum backward CDVT values received in the Set_Up indication primitive, or from the calling party, and the default delta backward CDVT values for the assigned VPCI, or the assumed default values. The default delta CDVT³ values for the assigned CDVT values shall be taken into account, in addition to the CDVT values received in the Set_Up indication primitive or the calling party, for subsequent processing in the exchange.

If resource allocation fails because the CDVT requirements cannot be met, the connection shall be released according to the procedures specified in 2.3.1/Q.2764 [2], "Lack of resources at the incoming side", with Cause #37 "User cell rate not available".

An incoming international exchange may release a call, if forward CDVT values are not conforming to the maximum CDVT allowed by the NPC function, according to the procedures specified in 2.3.1/Q.2764 [2], "Lack of resources at the incoming side" with Cause #37, "User cell rate not available".

¹ The forward CDVT value is in general increased unless traffic shaping is applied.

² The maximum backward CDVT value is in general decreased unless traffic shaping is applied.

³ The default delta CDVT value is implementation dependent.

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6.1.2 Non-assigning exchange

6.1.2.1 Sending of Set_Up request primitive

A non-assigning exchange shall perform the following action in addition to the procedures in Recommendation Q.2764 [2]:

The exchange shall determine the forward CDVT values to be included in the Set_Up request primitive, or to the called party, based on the values received in the Set_Up indication primitive⁴, or from the calling party, and the resource management calculations (see clause 6) on the input port. The resource management calculations for the output port are not taken into account until the output port is known at the receipt of the Incoming_Resources_Accepted indication primitive⁵.

The exchange shall determine the maximum backward CDVT value it can handle, excluding consideration of the output port, and that can match the maximum backward CDVT value received in the Set_Up indication primitive⁴, or from the calling party, taking into account the resource management calculations (see clause 6) for the input port, or that can match the assumed default values⁶.

If the exchange performs shaping, then upper bounds for forward CDVT values that the exchange may produce or backward CDVT values the exchange can accept are determined as a function of the values received in the Set_Up indication primitive from a preceding exchange, or from the called party. These values are sent in the Set_Up request primitive towards the succeeding exchange or indicated to the called party.

An outgoing international exchange may reduce the maximum backward CDVT values in conformance with the maximum CDVT allowed by the NPC function.

Upon the receipt of the Incoming_Resources_Accepted indication primitive, the non-assigning exchange will allocate resources based on the forward and backward CDVT values included in the Set_Up request primitive, or from the calling party, and the default delta forward and backward CDVT values for the assigned VPCI.

6.1.2.2 Receipt of Set_Up indication primitive

A non-assigning exchange shall perform the following actions in addition to the procedures in Recommendation Q.2764 [2]:

An incoming international exchange may release a call if the forward CDVT values do not conform to the maximum CDVT allowed by the NPC function following the procedures specified in 2.3.1/Q.2764 [2], "Lack of resources at the incoming side", with Cause #37, "User cell rate not available".

⁴ If the preceding exchange were acting as a non-assigning exchange, then the default delta CDVT values for the VPCI assigned on the incoming port is taken into account. If no values were received, then default values are assumed.

⁵ The forward CDVT value is generally increased unless traffic shaping is applied.

⁶ The maximum backward CDVT value is generally decreased unless traffic shaping is applied.

6.2 Answer

6.2.1 Assigning exchange

An assigning exchange shall perform the following actions in addition to the procedures in Recommendation Q.2764 [2]:

Backward resource allocation may be adjusted based on backward CDVT values.

Upon receipt of the answer indication primitive, the exchange shall determine the backward CDVT values which are applicable at the output port towards the preceding exchange, or to the calling party, based on the backward CDVT values received in the answer indication primitive or indicated by the called party. This may be achieved using resource management based calculations (see clause 6).

If this is not successful the connection shall be released with Cause #37, "User cell rate not available".

An incoming international exchange may release a call if backward CDVT values are not conforming to the maximum CDVT allowed by the NPC function, according to the procedures specified in 2.3.1/Q.2764 [2], "Lack of resources at the incoming side" with Cause #37, "User cell rate not available".

The locally determined backward CDVT values shall be always lower than the values included in the Set_Up indication primitive, or by the calling party, otherwise the call shall be released with Cause #37, "User cell rate not available".

The locally determined backward CDVT values shall be included in the answer request primitive issued towards the preceding exchange, or indicated to the calling party.

6.2.2 Non-assigning exchange

A non-assigning exchange shall perform the following actions in addition to the procedures in Recommendation Q.2764 [2]:

Upon receipt of the Answer indication primitive, the exchange shall determine the backward CDVT values which are applicable at the output port towards the preceding exchange or calling party, based on the backward CDVT values received in the Answer indication primitive, or indicated by the called party. This may be achieved using resource management based calculations (see clause 6).

An incoming international exchange may release a call, if forward CDVT values are not conforming to the maximum CDVT allowed by the NPC function, according to the procedures specified in 2.3.1/Q.2764 [2], "Lack of resources at the incoming side" with Cause #37, "User cell rate not available".

The locally determined backwards CDVT values shall be lower than the values indicated in the Set_Up request primitive; otherwise the call shall be released with Cause #37, "User cell rate not available".

The locally determined backward CDVT values shall be included in the answer request primitive issues towards the preceding exchange, or indicated to the calling party.

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6.3 Call Control primitive contents between SACF and Application Process

Table 3 shows the new parameters that must be added to the Set_Up request/indication primitive as specified in Recommendation Q.2764 [2]:

Table 3/Q.2723.5 – Parameters for Set_Up request/indication primitive

Set_Up request/indication	B-ISDN	N-ISDN
CDVT	O	–

Table 4 shows the new parameters that must be added to the Answer request/indication primitive as specified in Recommendation Q.2764 [2]:

Table 4/Q.2723.5 – Parameters for Answer request/indication primitive

Answer request/indication	B-ISDN	N-ISDN
CDVT	O	–

7 SACF

7.1 Outgoing messages

Table 6-1/Q.2764 [2] is changed as follows in Table 5:

Table 5/Q.2723.5 – Mapping between AP and ASE primitives

Interface d from AP	Interface c to CC ASE	Interface b to BCC ASE	Interface a to MC ASE
Answer req.	Call_Answer req.	Link_Information req. (Note)	
NOTE – The Link_Information request is issued to BCC ASE if the CDVT parameter is present.			

7.2 Incoming messages

Table 6-5/Q.2764 [2] is changed as follows in Table 6:

Table 6/Q.2723.5 – Distribution of received B-ISUP messages to BCC ASE and CC ASE

Received message	Primitive to BCC ASE	Primitive to CC ASE	Primitive to MC ASE
Answer	(Note)	Yes	
NOTE – Primitive issued to BCC ASE if the CDVT parameter is present.			

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7.3 Primitives interface between BCC ASE and SACF

Table 7 shows the new parameters to be added to the Link_Set-up request/indication primitive as specified in Recommendation Q.2764 [2]:

Table 7/Q.2723.5 – Parameters for Link_Set-up request/indication primitive

Link_Set-up request/indication
CDVT

Table 8 shows the new parameters to be added to the Link_Information request/indication primitive as specified in Recommendation Q.2764 [2]:

Table 8/Q.2723.5 – Parameters for Link_Information request/indication primitive

Link_Information request/indication
CDVT

8 BCC ASE descriptions

See clause 7/Q.2764 [2].

9 CC ASE descriptions

See clause 8/Q.2764 [2].

10 Interworking

10.1 Interworking with nodes which do not support the procedures described in this Recommendation

The CDVT parameter shall be discarded at such nodes.

NOTE – The instruction indicators should be set as shown in Appendix I in order to support the correct behaviour.

10.2 Interworking with DSS2

In addition to those already defined in Recommendation Q.2650 [13], the following mapping in Tables 9 and 10 of DSS2 information elements to B-ISUP parameters applies:

Table 9/Q.2723.5 – Mapping the IAM with the SETUP message

SETUP	IAM	SETUP
CDVT	CDVT	CDVT

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Table 10/Q.2723.5 – Mapping the ANM with the CONNECT message

CONNECT	ANM	CONNECT
CDVT	CDVT (Note)	CDVT
NOTE – Only the backward CDVT values are mapped.		

11 Interactions with other capabilities

11.1 Interactions with traffic parameter negotiation at connection establishment

When one or more than one traffic parameters of a connection is negotiated at connection establishment, using procedures defined in Recommendation Q.2725.1 [9], for a connection to which CDVT values other than the default values are expected or required, the CDVT values indicated shall be unique to the common set or range of traffic parameter negotiated values.

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

For further guidelines with respect to user aspects, see Recommendation Q.2961.5 [8].

11.2 Interactions with connection modification

When one or more than one traffic parameters of a connection is modified, using procedures defined in Recommendations Q.2725.2 [10] or Q.2725.4 [12], for a connection to which CDVT values other than the default values have been indicated or confirmed, the CDVT values allocated at connecting establishment shall be maintained unchanged.

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

For further guidelines with respect to user aspects see Recommendation Q.2961.5 [8].

APPENDIX I

Setting of instruction indicators

The setting of instruction indicators for the CDVT parameter is as follows:

Parameter	Pass on not possible ind.	Discard parameter ind.	Discard message ind.	Send notification ind.	Release Call ind.	Transit at intermediate exchange ind.	Broadband/narrow-band interworking ind.
CDVT	Default	Discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Discard parameter

APPENDIX II

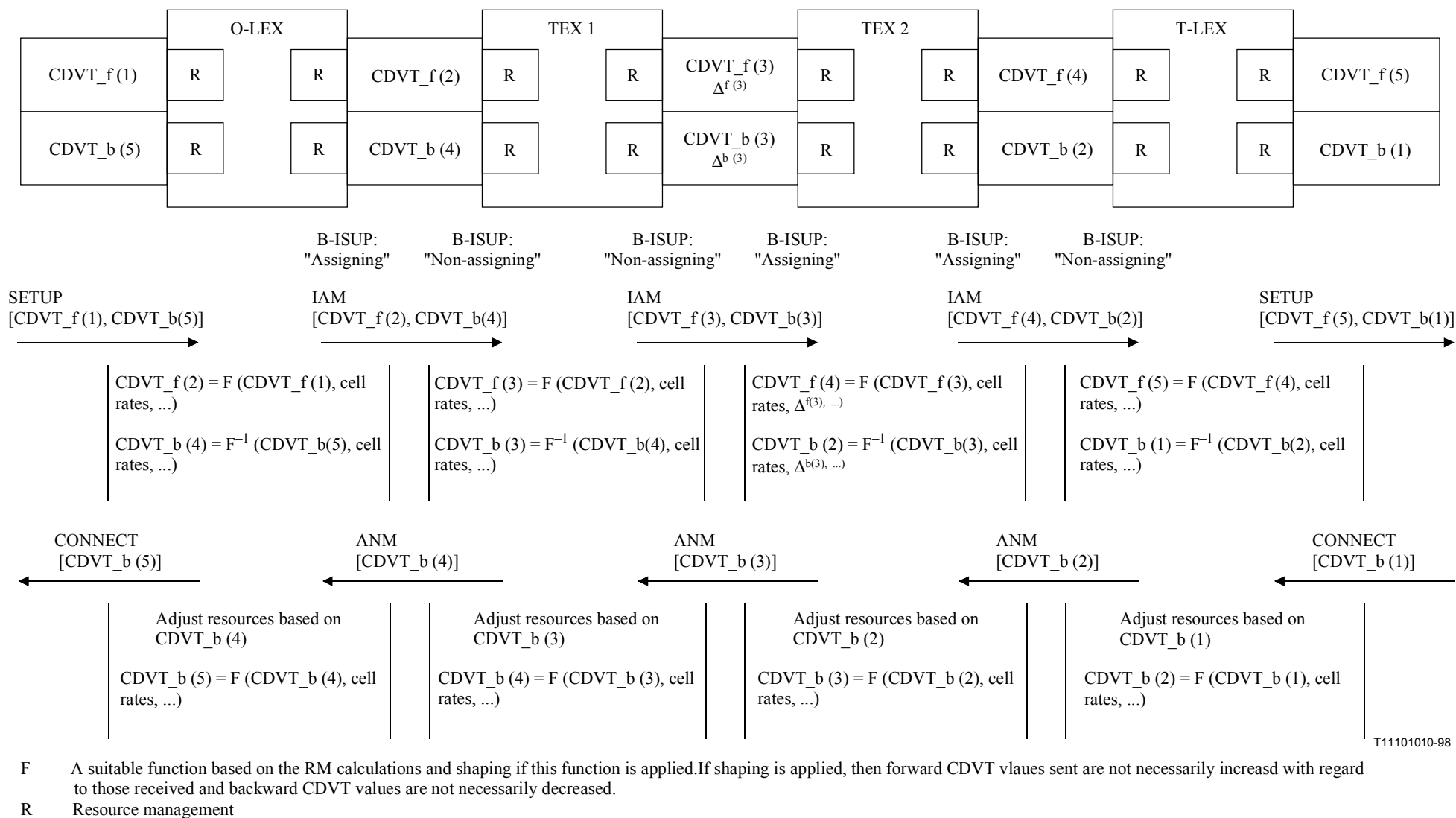


Figure II.1/Q.2723.5 – Illustration of the CDVT indication procedures
 (only SETUP/IAM and CONNECT/ANM are shown)

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