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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 negotiation
during connection setup**

ITU-T Recommendation Q.2725.1

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.2725.1

B-ISDN USER PART – SUPPORT OF NEGOTIATION DURING CONNECTION SETUP

Summary

This Recommendation specifies the extensions to the Broadband ISDN User Part for the support of negotiation of connection characteristics during connection setup.

Source

ITU-T Recommendation Q.2725.1 was prepared by ITU-T Study Group 11 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 9th of July 1996.

FOREWORD

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Recommendation Q.2725.1

B-ISDN USER PART – SUPPORT OF NEGOTIATION DURING CONNECTION SETUP

(Geneva, 1996)

1.1 General

1.1.1 Scope

This Recommendation specifies extensions to the broadband ISDN user part protocol to support negotiation of connection characteristics during connection setup.

It defines:

- new message and parameter coding needed to support the new capabilities;
- additional primitives and primitive parameters needed to model the new capabilities according to the specification model for the B-ISDN user part defined in Recommendation Q.2764;
- enhancements to the application process procedures; and
- description of the application service element.

Two cases of negotiation are allowed:

1) *Alternative ATM cell rate*

If the bandwidth requirements in the connection request cannot be supported by the network, alternative bandwidth requirements contained in the alternative ATM cell rate may be used instead, provided that these can be supported.

The alternative ATM cell rate can have any combination of traffic parameters that is allowed in the ATM cell rate and additional ATM cell rate for the specified broadband bearer capability. The alternative bandwidth requirements must be reduced compared to those originally requested.

2) *Minimum ATM cell rate*

If the bandwidth requirements in the connection request cannot be supported by the network, a reduced bandwidth allocation may be substituted, provided that this still satisfies a specified minimum ATM cell rate.

Only negotiation of peak cell rates is supported using the minimum ATM cell rate procedure.

In both cases 1) and 2), the final bandwidth used is returned in the ATM cell rate parameter and additional ATM cell rate parameter (if applicable) in the answer message. If this differs from the bandwidth allocation supported by the network, the network must modify the bandwidth allocation for the connection accordingly, and passes the final bandwidth information back to the calling user. If bandwidth modification is not possible, the connection is released.

Interworking with narrow-band emulation services is not supported.

Negotiation can only be performed with the first party of a point-to-multipoint call. Addition of a party prior to completion of the negotiation procedure is rejected.

1.1.2 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 Q.2962 (1996), *Digital Subscriber Signalling System No. 2 – Connection characteristics negotiation during call/connection establishment phase.*
- [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.2650 (1995), *Interworking between Signalling System No. 7 Broadband ISDN User Part (B-ISUP) and Digital Subscriber Signalling System No. 2 (DSS 2).*
- [4] ITU-T Recommendation Q.2723.1 (1996), *B-ISDN user part – Support of additional traffic parameters for sustainable cell rate and quality of service.*
- [5] ITU-T Recommendation Q.2961.1 (1995), *Additional signalling capabilities to support traffic parameters for the tagging option and the sustainable cell rate parameter set.*
- [6] ITU-T Recommendation Q.2763 (1995), *Signalling System No. 7 B-ISDN User Part (B-ISUP) – Formats and codes.*

1.1.3 Abbreviations

This Recommendation uses the following abbreviations.

ANM	Answer message
ASE	Application Service Element
ATM	Asynchronous Transfer Mode
BCC	Bearer Connection Control
IAM	Initial Address Message
SACF	Single Association Control Function

1.2 B-ISDN user part messages and parameters

1.2.1 Parameters and parameter subfields

The following new parameters and parameter subfields are required to support negotiation of connection characteristics at connection setup.

1.2.1.1 Alternative ATM cell rate

The alternative ATM cell rate parameter, as used by the procedures of this Recommendation, is coded as shown in Figure 1.

The parameter name code assigned to the alternative ATM cell rate parameter is 0101 0111.

	8	7	6	5	4	3	2	1	
1	ext. 1	Cell Rate Identifier							0
2									
3		Cell rate							
4									
...	ext. 1	Cell rate identifier							0
		Cell rate							
i	ext. 1	Cell rate identifier							1
i+1									
i+2		Cell rate							
i+3									

Figure 1/Q.2725.1 – Alternative ATM cell rate parameter field

The following codes are used in the subfields of the alternative ATM cell rate parameter field:

a) *Extension indicator (ext.)*

0 octet continues through the next octet (e.g. octet 1 to 1a)

1 last octet

b) *Cell rate identifier (octet i)*

The following codes are specified:

0000001 Forward peak cell rate for cell loss priority = 0

0000010 Backward peak cell rate for cell loss priority = 0

0000100 Forward peak cell rate for cell loss priority = 0+1

0000101 Backward peak cell rate for cell loss priority = 0+1

0001000 Forward sustainable cell rate for cell loss priority = 0

0001001 Backward sustainable cell rate for cell loss priority = 0

0010000 Forward sustainable cell rate for cell loss priority = 0+1

0010001 Backward sustainable cell rate for cell loss priority = 0+1

0100000 Forward maximum burst size for cell loss priority = 0

0100001 Backward maximum burst size for cell loss priority = 0

0110000 Forward maximum burst size for cell loss priority = 0+1

0110001 Backward maximum burst size for cell loss priority = 0+1

0111111 Reserved (used for traffic management options in Recommendation Q.2961)

Other codepoints are reserved.

NOTE – For details on the coding of the cell rate subfields, see Recommendations Q.2763 and Q.2723.1.

1.2.1.2 Minimum ATM cell rate

The minimum ATM cell rate parameter, as used by the procedures of this Recommendation, is coded identically to the ATM cell rate parameter, as shown in 7.6/Q.2763.

The parameter name code assigned to the minimum ATM cell rate parameter is 0101 0010.

1.2.2 Messages

The following tables show the impact of the new parameters on message coding.

1.2.2.1 IAM

The IAM must contain additional parameters as follows to support negotiation (see Table 1):

Table 1/Q.2725.1 – Additional parameters to be included in the IAM

IAM
Alternative ATM cell rate
Minimum ATM cell rate

1.2.2.2 ANM

The ANM must contain additional parameters as follows to support negotiation (see Table 2):

Table 2/Q.2725.1 – Additional parameters to be included in the ANM

ANM
Additional ATM cell rate
ATM cell rate

1.3 Application process procedures

1.3.1 Connection setup

1.3.1.1 Assignment procedure of VPCI/VCI and bandwidth

See 2.1.2/Q.2764 with the following additions:

If an exchange has to set up a connection for which alternative or minimum cell rates are specified (also in the case of an automatic repeat attempt), it shall:

- i) If available, use a VPCI for which it is the assigning exchange and set up the call using the original requested connection characteristics, i.e. a setup request including the connection element identifier parameter is issued. The exchange checks the alternative ATM cell rate (if present) to see if this can be supported by the allocated resources. If not, then the alternative ATM cell rate is discarded.
- ii) If the original requested connection characteristics cannot be supported using a VPCI for which it is the assigning exchange, do one of the following (depending on routing results):
 - a) act as the non-assigning exchange, i.e. issue a setup request without the connection element identifier parameter, but using the original requested connection characteristics;
 - or

- b) issue a setup request using a VPCI for which it is the assigning exchange, requesting (as applicable):
 - either a cell rate between the original requested cell rate and the minimum ATM cell rate;
 - or the alternative ATM cell rate; or
- c) if neither a) nor b) is possible, i.e. no VPCI is available that can support the connection characteristics originally requested, or the minimum ATM cell rate or alternative ATM cell rate requested by the user, then the connection shall be released.

1.3.1.2 Action required at the originating exchange

See 2.2.1.1/Q.2764 with the following additions:

a) *Assigning exchange*

For the minimum ATM cell rate parameter:

If the exchange can support the requested connection characteristics, it will include the original requested connection characteristics, as well as the minimum ATM cell rate parameter in the setup request primitive.

Depending on routing conditions, the following applies:

If the exchange cannot support the requested connection characteristics, but can support a cell rate between the requested cell rate and the minimum ATM cell rate, then the exchange does VPCI/VCI selection and bandwidth allocation accordingly, inserts this cell rate into the ATM cell rate parameter and includes both the ATM cell rate and minimum ATM cell rate parameters in the setup request primitive.

If the exchange can support only the minimum ATM cell rate, then the exchange does VPCI/VCI selection and bandwidth allocation accordingly, inserts this value into the ATM cell rate parameter and includes only the ATM cell rate parameter in the setup request primitive.

For the alternative ATM cell rate parameter:

If the exchange can support the requested connection characteristics, it will include the original requested connection characteristics, as well as the alternative ATM cell rate parameter in the setup request primitive. The exchange checks the alternative ATM cell rate to see if this can be supported by the allocated resources. If not, then the alternative ATM cell rate is discarded.

Depending on routing conditions, the following applies:

If the exchange cannot support the requested connection characteristics, but can support the alternative ATM cell rate, then the exchange does bandwidth allocation accordingly, and inserts this value into the ATM cell rate parameter and additional ATM cell rate parameter (if applicable) in the setup request primitive, and discards the alternative ATM cell rate parameter.

If the exchange cannot support the connection characteristics requested by the user, and also cannot support the alternative ATM cell rate requested by the user, the connection shall be released with the cause "bandwidth not available".

b) *Non-assigning exchange*

The exchange passes the received alternative ATM cell rate parameter or minimum ATM cell rate parameter in the setup request primitive.

c) *Point-to-multipoint call*

Negotiation can only be performed with the first party of a point-to-multipoint call. Addition of a party prior to completion of the negotiation procedure is rejected.

1.3.1.3 Action required at an intermediate national exchange

See 2.2.1.2/Q.2764 with the following addition:

1.3.1.3.1 Incoming side of the exchange

a) *Assigning exchange*

If the connection request contains the alternative ATM cell rate parameter or the minimum ATM cell rate parameter, the following applies:

For the minimum ATM cell rate parameter:

If the exchange can support the requested connection characteristics, it will allocate resources using normal procedures.

If the exchange cannot support the requested connection characteristics, but can support a cell rate between the requested cell rate and the minimum ATM cell rate, then the exchange does VPCI/VCI selection and bandwidth allocation based on this cell rate. This cell rate is used as the ATM cell rate in subsequent processing, together with the minimum ATM cell rate.

If the exchange only supports the minimum ATM cell rate, then the exchange does VPCI/VCI selection and bandwidth allocation based on this cell rate. This cell rate is used as the ATM cell rate in subsequent processing, and the minimum ATM cell rate is not passed.

For the alternative ATM cell rate parameter:

If the exchange can support the requested connection characteristics, it will allocate resources using normal procedures. The exchange checks the alternative ATM cell rate to see if this can be supported by the allocated resources. If not, then the alternative ATM cell rate is discarded.

If the exchange cannot support the requested connection characteristics, but can support the alternative ATM cell rate, then the exchange does VPCI/VCI selection and bandwidth allocation accordingly. This bandwidth allocation is used in subsequent processing, and the alternative ATM cell rate is not passed.

If the exchange cannot support the connection characteristics requested by the user, and also cannot support the alternative ATM cell rate requested by the user, the connection shall be released with the cause "bandwidth not available".

b) *Non-assigning exchange*

The exchange follows normal procedures.

1.3.1.3.2 Other actions

The procedures in 2.2.1.2.2/Q.2764 are followed, with additions as in 1.3.1.2 above.

1.3.1.4 Action required at an outgoing international exchange

The procedures in 2.2.1.3/Q.2764 are followed, with additions as in 1.3.1.3.1 above.

1.3.1.5 Action required at an intermediate or incoming international exchange

The procedures in 2.2.1.4/Q.2764 are followed, with additions as in 1.3.1.3.1 above.

1.3.1.6 Action required at the destination exchange

The procedures in 2.2.1.5/Q.2764 are followed, with additions as in 1.3.1.3.1 above.

1.3.2 Answer primitive

1.3.2.1 Action required at the destination exchange

See 2.2.5.1/Q.2764 with the following addition:

When the called party answers with an indication of the final bandwidth used, the exchange shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported ATM cell rate, if the bandwidth already allocated is different. The answer request primitive shall contain the ATM cell rate parameter and, if applicable, the additional ATM cell rate parameter.

When the called party answers without the indication of final bandwidth allocation, the exchange shall put the ATM cell rate parameter and, if applicable, the additional ATM cell rate parameter in the answer primitive according to the bandwidth allocation used in that exchange.

1.3.2.2 Action required at an intermediate national exchange

See 2.2.5.2/Q.2764 with the following addition:

Upon receipt of an answer indication primitive with the ATM cell rate parameter and, if applicable, the additional ATM cell rate parameter, the exchange shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported final bandwidth allocation, if the bandwidth previously allocated by the exchange is different. The answer request primitive shall contain the ATM cell rate parameter and, if applicable, additional ATM cell rate parameter.

Upon receipt of an answer indication primitive without the ATM cell rate parameter, the exchange shall put the ATM cell rate parameter and, if applicable, the additional ATM cell rate parameter in the answer request primitive according to the bandwidth allocation used in that exchange.

1.3.2.3 Action required at an outgoing international exchange

See 1.3.2.2. Additionally, if the answer indication is received after the Address Complete indication, timer "await answer" is stopped.

1.3.2.4 Action required at an intermediate or incoming international exchange

See 1.3.2.2.

1.3.2.5 Action required at the originating exchange

See 2.2.5.5/Q.2764, with the following addition:

Upon receipt of an answer indication primitive containing the ATM cell rate parameter and, if applicable, additional ATM cell rate parameter, the exchange shall modify the allocated bandwidth on those portions of the connection for which it is the assigning exchange according to the reported ATM cell rate, if the bandwidth already allocated is different. The final bandwidth allocation is transferred in the indication returned to the calling user.

Upon receipt of an answer indication primitive without the ATM cell rate parameter, the exchange shall indicate the final bandwidth allocation used in that exchange in the indication returned to the calling user.

1.3.2.6 Exceptional procedures

If the exchange cannot modify the allocated bandwidth, the connection shall be released in both directions with the cause "bandwidth not available".

1.4 Application service elements and primitives

The following primitives are affected by support of negotiation during connection setup.

1.4.1 Primitives between SACF and application process

1.4.1.1 Setup request/indication primitive

Table 3 shows parameters that must be added to the setup request/indication primitive.

Table 3/Q.2725.1 – Parameters for setup request/indication primitive

Setup request/indication	B-ISDN
Alternative ATM cell rate	O (Note)
Minimum ATM cell rate	O (Note)
NOTE – Either the alternative ATM cell rate parameter or the minimum ATM cell rate parameter is included depending on the specific procedure.	

1.4.1.2 Answer request/indication primitive

Table 4 shows parameters that must be added to the answer request/indication primitive.

Table 4/Q.2725.1 – Parameters for answer request/indication primitive

Answer request/indication	B-ISDN
ATM cell rate	O
Additional ATM cell rate	O

1.4.2 Primitives between BCC ASE and SACF

1.4.2.1 Link_Setup request/indication primitive

Table 5 shows new parameters that must be added to the Link_Setup request/indication primitive.

Table 5/Q.2725.1 – Parameters for Link_Setup request/indication primitive

Link_Setup request/indication
Alternative ATM cell rate
Minimum ATM cell rate

1.4.2.2 Link_Information request/indication primitive

Table 6 shows parameters that must be added to the Link_Information request/indication primitive.

Table 6/Q.2725.1 – Parameters for Link_Information request/indication primitive

Link_Information request/indication
ATM cell rate
Additional ATM cell rate

1.4.3 ASE descriptions

No changes are required to the ASE descriptions for BCC or CC ASEs.

1.5 Interworking

1.5.1 Interworking with CS-1 nodes

CS-1 nodes will treat the alternative ATM cell rate or minimum ATM cell rate parameters as unrecognized signalling information. The instruction indicators for these parameters will be set so as to discard these parameters at the CS-1 node and continue processing based on the ATM cell rate parameter and (if applicable) additional ATM cell rate only.

The setting of the instruction indicators is shown in Appendix I.

1.5.2 Interworking with ISUP

The connection is released at the interworking exchange.

1.5.3 Interworking with DSS 2

The following mapping of DSS 2 information elements to B-ISUP parameters is followed, in addition to those mappings already shown in Recommendations Q.2650 and Q.2723.1. See Table 7.

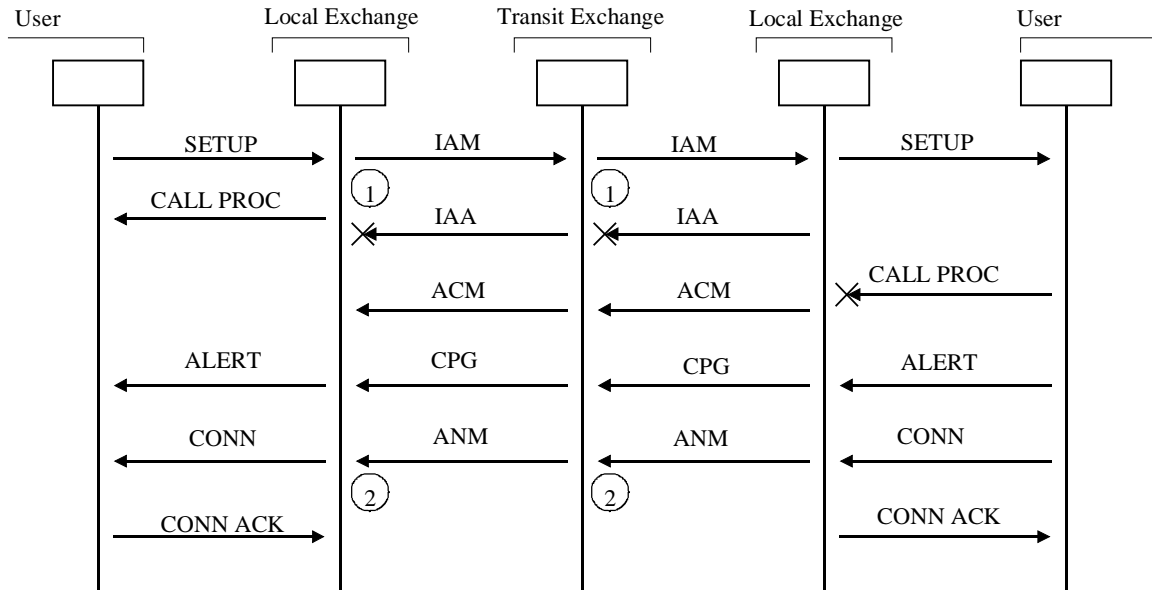
Table 7/Q.2725.1 – Mapping of DSS 2 information elements to B-ISUP parameters

SETUP	IAM	SETUP
Alternative ATM traffic descriptor	Alternative ATM cell rate	Alternative ATM traffic descriptor
Minimum acceptable ATM traffic descriptor	Minimum ATM cell rate	Minimum acceptable ATM traffic descriptor

CONNECT	ANM	CONNECT
ATM traffic descriptor	ATM cell rate Additional ATM cell rate (Note)	ATM traffic descriptor
NOTE – Mapping as in Recommendation Q.2723.1.		

ANNEX A

Message flow diagrams



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Figure A.1/Q.2725.1 – Negotiation during call setup

- 1) If the original request cannot be supported, then the sending switch either:
 - a) initiates setup using the non-assigning exchange procedure. The receiving switch may allocate resources based on the alternative or minimum ATM cell rate; or
 - b) uses the assigning exchange procedure and initiates setup with a reduced resource request based on the alternative ATM cell rate or minimum ATM cell rate as applicable.
- 2) Switch modifies resource allocation based on ATM cell rate received in backwards direction, as appropriate.

APPENDIX I

Setting of instruction indicators

The setting of the instruction indicators for the alternative ATM cell rate parameter and the minimum ATM cell rate parameter is as follows:

Parameter	Pass on not possible ind.	Discard parameter ind.	Discard message ind.	Send notification ind.	Release call ind.	Transit at intermed. exchange ind.	Broadband /narrow-band inter-working ind.
Alternative ATM cell rate	Default	Discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Release call
Minimum ATM cell rate	Default	Discard parameter	Do not discard message	Do not send notification	Do not release call	End node interpretation	Release call

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