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SERIES Q: SWITCHING AND SIGNALLING

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

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Extensions to the B-ISDN User Part – Signalling capabilities to support traffic parameters for the ATM Block Transfer (ABT) ATM transfer capability

ITU-T Recommendation Q.2723.4

Superseded by a more recent version

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.2723.4

EXTENSIONS TO THE B-ISDN USER PART – SIGNALLING CAPABILITIES TO SUPPORT TRAFFIC PARAMETERS FOR THE ATM BLOCK TRANSFER (ABT) ATM TRANSFER CAPABILITY

Summary

This Recommendation belongs to the set of Q.2723-Series of Recommendations that cover the support of additional traffic parameters through the broadband integrated services digital network user part.

This Recommendation describes the Broadband ISDN user part support of services provided through the ATM block transfer ATM layer transfer capability as defined in Recommendation I.371. This Recommendation describes the additional traffic parameters and procedures to be provided beyond the ones already specified by Recommendations Q.2761, Q.2962, Q.2963, Q.2964, Q.2723.1 and Q.2725.1.

Source

ITU-T Recommendation Q.2723.4 was prepared by ITU-T Study Group 11 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 12th of September 1997.

FOREWORD

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

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NOTE

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EXTENSIONS TO THE B-ISDN USER PART – SIGNALLING CAPABILITIES TO SUPPORT TRAFFIC PARAMETERS FOR THE ATM BLOCK TRANSFER (ABT) ATM TRANSFER CAPABILITY

(Geneva, 1997)

1 Overview

An ATM Block Transfer (ABT) capability is an ATM layer mechanism providing a service where the ATM layer transfer characteristics are negotiated on an ATM block basis. Within an ATM block accepted by the network, the network allocates sufficient resources such that the QOS received by the ATM block is equivalent to QOS received by a DBR connection with the same peak cell rate as the negotiated peak cell rate of the ATM block.

Two ABT traffic handling capabilities are defined, namely the ATM block transfer with Delayed Transmission (ABT-DT) and the ATM block transfer with Immediate Transmission (ABT-IT).

In ABT-DT, during the connection lifetime, the cell rate of successive ATM blocks is dynamically modified between the users of the ABT-DT capability and the network using resource management cells. Positive acknowledgement from the network is required before transmitting ATM blocks at the new cell rate.

In ABT-IT, the user transmits ATM blocks without waiting for the positive acknowledgement from the network. As a result, ABT-IT ATM blocks may be corrupted due to the discard of cells by the network if sufficient network resources are not available.

1.1 Scope

This Recommendation specifies extensions to the Broadband ISDN user part protocol to support the services that are provided through the ATM block transfer ATM layer transfer capability as defined in Recommendation I.371 [1]. This Recommendation describes the additional traffic parameters and procedures to be provided beyond the ones already specified by Recommendations Q.2761 to Q.2764 [2] to [5], Q.2723.1 [7] and Q.2725.1 [8], in order to support the ATM block transfer capability in a point-to-point configuration type.

It defines:

– new parameter subfields coding needed;

– additional primitive parameters needed to model the new capabilities according to the specification model for B-ISUP as defined in Recommendation Q.2764 [5];

– application procedure enhancements;

– ASE description enhancements.

The procedures for the negotiation of the ABT traffic parameters during the connection establishment are covered by this Recommendation, while B-ISUP signalling procedures for the modification of traffic parameters during the active phase of the call are outside the scope of this Recommendation.

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 I.371 (1996), *Traffic control and congestion control in B-ISDN*.

[2] ITU-T Recommendation Q.2761 (1995), *Functional description of the broadband ISDN User Part (B-ISUP) of Signalling System No. 7*.

[3] ITU-T Recommendation Q.2762 (1995), *General functions of messages and signals of the B-ISDN User Part (B-ISUP) of Signalling System No. 7*.

[4] ITU-T Recommendation Q.2763 (1995), *Signalling System No. 7 B-ISDN User Part (B-ISUP) – Formats and codes*.

[5] ITU-T Recommendation Q.2764 (1995), *Signalling System No. 7 B-ISDN User Part (B-ISUP) – Basic call procedures*.

[6] 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)*.

[7] ITU-T Recommendation Q.2723.1 (1996), *B-ISDN user part – Support of additional traffic parameters for sustainable rate cells and quality of service*.

[8] ITU-T Recommendation Q.2725.1 (1996), *B-ISDN user part – Support of negotiation during connection setup*.

[9] 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.*

[10] 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*.

[11] 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*.

[12] 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*.

1.3 Abbreviations

This Recommendation uses the following abbreviations:

ABT-DT ATM block transfer with Delayed Transmission

ABT-IT ATM block transfer with Immediate Transmission

ANM Answer Message

ASE Application Service Element

ATC ATM Transfer Capability

BTC Broadband Transfer Capability

CLP Cell Loss Priority
DBR Deterministic Bit Rate
IAM Initial Address Message
MBS Maximum Burst Size
QOS Quality of Service
PCR Peak Cell Rate
RM Resource Management
SCR Sustainable Cell Rate

2 B-ISDN user part parameters and messages

2.1 Parameters

The following parameter subfields are required to support ABT ATC. The valid combination of traffic related parameters for ABT-DT and ABT-IT ATCs are specified in Annex F/I.371 [1] and Annex A/Q.2961.4 [11].

2.1.1 ATM cell rate

Subfield coding is as in Recommendation Q.2763 [4]. Only the forward and backward PCR fields for CLP = 0 + 1 component are relevant.

2.1.2 Additional ATM cell rate

The subfield coding of this parameter is defined in Figure 1/Q.2723.1 [7]. This parameter is extended as follows to take into account the indication of forward and backward RM PCR.

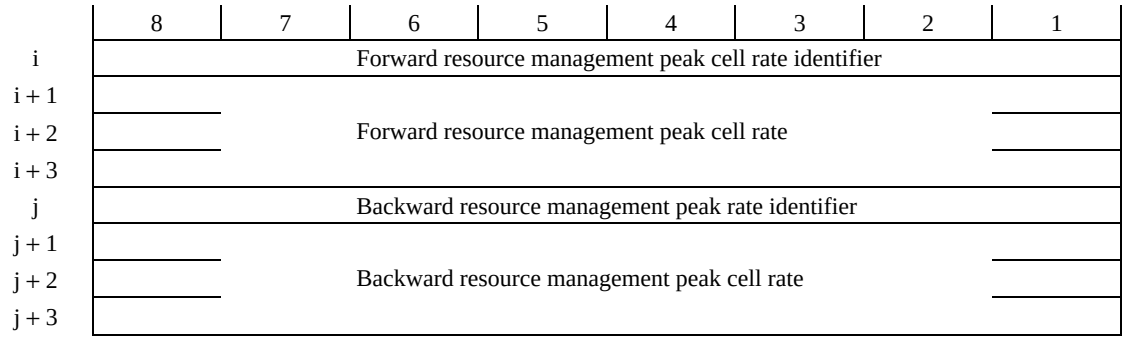

Figure 1/Q.2723.4 – Extended coding of the Additional ATM cell rate parameter

NOTE 1 – Octet groups (or subfields) i and j may be included in any order within the parameter. This general encoding rule applies to all B-ISUP Recommendations whenever octet groups (or subfields) are identified or tagged by a one-octet identifier within a parameter.

NOTE 2 – Octet groups (or subfields) tagged by a one-octet identifier are not extensible. Although some B-ISUP Recommendations may include octet groups (or subfields) tagged by a one-octet field with bit 8 shown as an extension bit, no requirement for their future extension is foreseen. Implementations may therefore safely handle such a bit 8 of an identifier octet as an integral part of the octet group identifier. To ensure backward compatibility, subfield identifiers shall not be defined with bit 8 set to 0.

The following codings are used:

a) *Cell rate identifier*

The following identifier codes are specified (Note 3):

octet i	11000000	Forward resource management peak cell rate
octet j	11000001	Backward resource management peak cell rate

NOTE 3 – Applicable when the ATM transfer capability indicates ABT-DT or ABT-IT in the broadband bearer capability parameter.

b) *Resource management peak cell rate*

The forward and backward resource management peak cell rates indicate the cell rate requested for resource management. The number of cells per second is coded as a 3-octet binary representation. Bit 8 of the first octet (i + 1 or j + 1) is the most significant and bit 1 of the third octet (i + 3 or j + 3) is the least significant respectively.

NOTE 4 – The CLP bit of the resource management cells is always set to 0.

NOTE 5 – The forward/backward RM PCR are not included in the forward/backward PCR values specified in the ATM cell rate parameter.

2.1.3 Broadband bearer capability

The format of the broadband bearer capability parameter defined in Recommendation Q.2763 [4] is modified as shown in Recommendations Q.2961.2 [9] and Q.2723.2 [12].

The coding of subfields for ABT ATC is given in Recommendation Q.2961.4 [11].

2.1.4 Minimum ATM cell rate

The minimum ATM cell rate parameter is defined in Figure 1/Q.2725.1 [5]. This parameter is extended to enable the negotiation of forward and backward RM PCR, MBS and SCR for CLP = 0 + 1 component.

	8	7	6	5	4	3	2	1
i	Forward sustainable cell rate (CLP = 0 + 1) identifier							
i + 1								
i + 2			Forward sustainable cell rate (CLP = 0 + 1)					
i + 3								
j	Backward sustainable cell rate (CLP = 0 + 1) identifier							
j + 1								
j + 2			Backward sustainable cell rate (CLP = 0 + 1)					
j + 3								
k	Forward maximum burst size (CLP = 0 + 1) identifier							
k + 1								
k + 2			Forward maximum burst size (CLP = 0 + 1)					
k + 3								
l	Backward maximum burst size (CLP = 0 + 1) identifier							
l + 1								
l + 2			Backward maximum burst size (CLP = 0 + 1)					
l + 3								
m	Forward resource management cell rate identifier							
m + 1								
m + 2			Forward resource management cell rate					
m + 3								
n	Backward resource management cell rate identifier							
n + 1								
n + 2			Backward resource management cell rate					
n + 3								

Figure 2/Q.2723.4 – Extended coding of the Minimum ATM cell rate parameter

NOTE 1 – According to the general encoding rule, octet groups (or subfields) i through n may be included in any order within the parameter. Not all the subfields shown need to be included in a parameter instance, depending on the actual traffic characteristics negotiation requirements (see Recommendation Q.2961.4 [11]).

NOTE 2 – Octet groups (or subfields) tagged by a one octet identifier are not extensible. Although some B-ISUP Recommendations may include octet groups (or subfields) tagged by a one-octet field with bit 8 shown as an extension bit, no requirement for their future extension is foreseen. Implementations may therefore safely handle such a bit 8 of an identifier octet as an integral part of the octet group identifier. To ensure backward compatibility, subfield identifiers shall not be defined with bit 8 set to 0.

The following codings are used:

a) *Cell rate identifier*

The following identifier codes are specified (Note 3):

octet i	10010000	Forward sustainable cell rate for cell loss priority = 0 + 1
octet j	10010001	Backward sustainable cell rate for cell loss priority = 0 + 1
octet k	10110000	Forward maximum burst size for cell loss priority = 0 + 1
octet l	10110001	Backward maximum burst size for cell loss priority = 0 + 1
octet m	11000000	Forward resource management peak cell rate
octet n	11000001	Backward resource management peak cell rate

NOTE 3 – Applicable when the ATM transfer capability indicates ABT-DT or ABT-IT in the broadband bearer capability parameter.

b) *Sustainable cell rate for CLP = 0 + 1*

The number of cells per second is coded as a 3-octet binary representation. Bit 8 of the first octet (i + 1 or j + 1) is the most significant and bit 1 of the third octet (i + 3 or j + 3) is the least significant respectively.

c) *Maximum burst size for CLP = 0 + 1*

The maximum burst size in cells is coded as a 3-octet binary representation. Bit 8 of the first octet (k + 1 or l + 1) is the most significant and bit 1 of the third octet (k + 3 or l + 3) is the least significant respectively.

d) *Resource management peak cell rate*

The forward and backward resource management peak cell rate subfields, when included in this parameter, indicate the cell rate requested for resource management. The number of cells per second is coded as a 3-octet binary representation. Bit 8 of the first octet (m + 1 or n + 1) is the most significant and bit 1 of the third octet (m + 3 or n + 3) is the least significant respectively.

NOTE 4 – The CLP bit of the resource management cells is always set to 0.

NOTE 5 – The forward/backward RM PCR are not included in the forward/backward PCR values of the minimum ATM cell rate parameter.

2.2 Messages

In the following, the parameters defined in Recommendations Q.2763 [4], Q.2725.1 [8] and in the Q.2723-Series [7], [12] relevant to ABT and the negotiation procedure and which require coding enhancements are indicated. No new messages or parameters are defined.

2.2.1 Initial address message

Table 1/Q.2723.4

IAM
ATM cell rate
Additional ATM cell rate
Minimum ATM cell rate
Broadband bearer capability

2.2.2 Answer message

Table 2/Q.2723.4

ANM
ATM cell rate
Additional ATM cell rate

3 Application process procedures

The exchange application process procedures as defined in Recommendations Q.2764 [5] for basic call, Q.2723.1 [7] for the support of additional traffic parameters for SCR and Q.2725.1 [8] for the negotiation of traffic parameters during connection establishment through the indication of a minimum ATM cell rate parameter, shall apply. The additional procedures required are described below.

3.1 Connection establishment

3.1.1 Assignment procedure of VPCI/VCI and bandwidth

See 2.1.2/Q.2764 [5] with the following additions:

If an exchange has to establish a connection for which ABT is indicated as ATC (including in the case of an automatic repeat attempt), it shall:

i) if available, use a VPCI for which it is the assigning exchange and which can provide the requested resources according to PCR, SCR, MBS, RM PCR and set up the call using the original requested connection characteristics indicated in the ATM cell rate and additional ATM cell rate parameters, i.e. a Set_Up request including the connection element identifier parameter is issued.

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 Set_Up request primitive without the connection element identifier parameter, but using the original requested connection characteristics; or

   b) issue a Set_Up request primitive using a VPCI for which it is the assigning exchange, requesting a cell rate between the original requested cell rates and the minimum cell rates for PCR, SCR, MBS and RM PCR as indicated in the minimum ATM cell rate parameter;

   c) if neither a) not b) is possible, i.e. no VPCI is available that can support the connection characteristics originally requested, or the minimum ATM cell rate requested by the user, then the connection shall be released with cause No. 37 "User cell rate not available".

3.1.2 Action required at the originating exchange

See 2.2.1.1/Q.2764 [5] with the following additions.

a) *Assigning exchange*

   If the exchange can support the requested connection characteristics, it will include the original requested connection characteristics and, if present, the minimum ATM cell rate parameter, in the Set_Up request primitive.

   If the exchange cannot support the original connection characteristics and the minimum ATM cell rate parameter is not present, then the connection shall be released with the cause No. 37 "User cell rate not available".

If the minimum ATM cell rate parameter is present and depending on routing conditions, the following apply:

– If the exchange cannot support the requested connection characteristics, but can support values for traffic parameters between those requested and the minimum values, then the exchange does VPCI/VCI selection and bandwidth allocation accordingly, inserts these values into the ATM cell rate and the additional ATM cell rate parameters and includes the ATM cell rate, the additional ATM cell rate and the minimum ATM cell rate parameters in the Set_Up request primitive.

– If the exchange can only support the minimum ATM cell rate, then the exchange does VPCI/VCI selection and resource allocation accordingly, inserts this value into the ATM cell rate and additional ATM cell rate parameters and includes only the ATM cell rate and the additional ATM cell rate parameters in the Set_Up request primitive.

– If the exchange cannot support the original connection characteristics requested by the user, and also cannot support the minimum ATM traffic values requested by the user, the connection shall be released with cause No. 37 "User cell rate not available".

b) *Non-assigning exchange*

The exchange passes the received ATM cell rate, additional ATM cell rate and, if applicable, the minimum ATM cell rate parameters in the Set_Up request primitive.

3.1.3 Action required at an intermediate national exchange

See 2.2.1.2/Q.2764 [5] with the following addition.

3.1.3.1 Incoming side of the exchange

a) *Assigning exchange*

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

If the exchange cannot support the original connection characteristics and the minimum ATM cell rate parameter is not present, then the call shall be released with the cause No. 37 "User cell rate not available".

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

– If the exchange cannot support the requested connection characteristics, but can support values for traffic parameters between those requested in the ATM cell rate and additional ATM cell rate parameters and the minimum values in the minimum ATM cell rate parameter, then the exchange does VPCI/VCI selection and resource allocation based on these values. These cell rates are used as the ATM cell rate and the additional ATM cell rate parameters in subsequent processing, together with the minimum ATM cell rate parameter.

– If the exchange can only support the minimum ATM cell rate, then the exchange does VPCI/VCI selection and resource allocation based on this parameter. These connection characteristics will be used in the ATM cell rate and additional ATM cell rate parameters in subsequent processing, and the minimum ATM cell rate parameter is not passed.

– If the exchange cannot support the connection characteristics requested, nor the minimum ATM cell rate, the connection shall be released with cause No. 37 "User cell rate not available".

b) *Non-assigning exchange*

The exchange follows normal procedures.

3.1.3.2 Other actions

The procedures in 2.2.1.2.2/Q.2764 [5] are followed, with additions as in 3.1.2 above.

3.1.4 Action required at an outgoing international exchange

The procedures in 2.2.1.3/Q.2764 [5] are followed, with additions as in 3.1.3 above.

3.1.5 Action required at an intermediate or incoming international exchange

The procedures in 2.2.1.4/Q.2764 [5] are followed, with additions as in 3.1.3 above.

3.1.6 Action required at the destination exchange

The procedures in 2.2.1.5/Q.2764 [5] are followed, with additions as in 3.1.3.2 above.

3.2 Answer primitive

3.2.1 Actions required at the destination exchange

See 2.2.5.1/Q.2764 [5] with the following addition if any ATM traffic values are negotiated.

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

When the called party answers without the indication of final resource allocation, the exchange shall include the ATM cell rate parameter and the additional ATM cell rate parameter in the Answer primitive according to the bandwidth allocation used in that exchange.

3.2.2 Action required at an intermediate national exchange

See 2.2.5.2/Q.2764 [5] with the following addition.

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

Upon receipt of an Answer indication primitive without the ATM cell rate parameter, the exchange shall put the ATM cell rate and the additional ATM cell rate parameters in the Answer request primitive according to the resource allocation used in that exchange.

3.2.3 Action required at an outgoing international exchange

See 3.2.2. Additionally, if the answer indication is received after the address complete indication, timer "await answer" is stopped.

3.2.4 Action required at an intermediate or incoming international exchange

See 3.2.2.

3.2.5 Action required at the originating exchange

See 2.2.5.5/Q.2764 [5], with the following addition if any ATM traffic values are negotiated.

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

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

4 Application service elements and primitives

See Recommendation Q.2764 [5]. In addition the support of ABT impacts the following primitives.

4.1 Primitives between SACF and application process

4.1.1 Set_Up request/indication primitive

Table 3 shows parameters as modified by this Recommendation that are added to the Set_Up request/indication primitive.

Table 3/Q.2723.4 – Parameters for Set_Up request/indication primitive

Set_Up request/indication	B-ISDN
Minimum ATM cell rate	O
ATM cell rate	M
Additional ATM cell rate	O
Broadband bearer capability	M

4.1.2 Answer request/indication primitive

Table 4 shows parameters that are added to the Answer request/indication primitive.

Table 4/Q.2723.4 – Parameters for Answer request/indication primitive

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

4.2 Primitives between BCC ASE and SACF

4.2.1 Link_Setup request/indication primitive

Table 5 shows the parameters as modified by this Recommendation that are added to the Link_Setup request/indication primitive.

Table 5/Q.2723.4 – Parameters for Link_Setup request/indication primitive

Link_Setup request/indication
Minimum ATM cell rate
ATM cell rate
Additional ATM cell rate
Broadband bearer capability

4.2.2 Link_Information request/indication primitive

Table 6 shows the parameters as modified by this Recommendation that are added to the Link_Information request/indication primitive.

Table 6/Q.2723.4 – Parameters for Link_Information request/indication primitive

Link_Information request/indication
ATM cell rate
Additional ATM cell rate

4.3 ASE descriptions

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

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

As the indication of the ABT ATC in the Broadband bearer capability parameter is routing relevant, a call/connection using ABT shall not be routed to an exchange not supporting that service, unless there is an error in routing. If such an error occurs the following applies:

As nodes not supporting that service do not support the ABT specific traffic indications and thus do not support the parameter subfields defined in this Recommendation, they shall handle them, if such ABT specific parameter subfields are received, by applying the procedures defined for the receipt of unrecognized signalling information. The instruction indicators for these parameters shall be set so as to release the call/connection.

NOTE – In order to ensure the correct behaviour, the instruction indicators should be set as given in Appendix II/Q.2764 [5] for the Broadband bearer capability parameter, in Appendix I/Q.2723.1 [7] for the additional ATM cell rate parameter and in Recommendation Q.2725.1 [8] for the minimum ATM cell rate parameter.

6 Interworking with N-ISUP

The ABT transfer capability call/connections are not supported by the Signalling System No. 7 ISDN User Part (ISUP) and shall be released at the interworking point, with the cause No. 63 "Service or option not available, unspecified".

7 Interworking with DSS 2

In addition to those already defined in Recommendation Q.2650 [6], the following mapping of B-ISUP parameters to DSS 2 information elements applies:

Table 7/Q.2723.4 – Additional mapping of B-ISUP parameters to DSS 2 information elements

SETUP	IAM	SETUP
ATM traffic descriptor	ATM cell rate Additional ATM cell rate (Note)	ATM traffic descriptor
Minimum ATM traffic descriptor	Minimum ATM cell rate	Minimum ATM traffic descriptor
Broadband bearer capability	Broadband bearer capability	Broadband bearer capability

CONNECT	ANM	CONNECT
ATM traffic descriptor	ATM cell rate Additional ATM cell rate (Note)	ATM traffic descriptor
NOTE – The peak cell rate subfields for the CLP = 0 + 1 component of the DSS 2 ATM traffic descriptor information element are mapped to the B-ISUP ATM cell rate parameter, while the sustainable cell rate and maximum burst size subfields for the CLP = 0 + 1 component and RM PCR subfields of the DSS 2 ATM traffic descriptor are mapped to the B-ISUP additional ATM cell rate parameter.		

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