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SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – B-ISDN application protocols for access signalling

Digital Subscriber Signalling System No. 2 – Connection characteristics negotiation during call/connection establishment phase

ITU-T Recommendation Q.2962

ITU-T Q-SERIES RECOMMENDATIONS

SWITCHING AND SIGNALLING

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ITU-T RECOMMENDATION Q.2962

DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 2 – CONNECTION CHARACTERISTICS NEGOTIATION DURING CALL/CONNECTION ESTABLISHMENT PHASE

Summary

This Recommendation defines the operation of the Digital Subscriber Signalling System No. 2 (DSS 2) for the handling of the Connection characteristics negotiation during Call/Connection establishment phase, that may be supported, as a network option, at the T_B or at the coincident S_B and T_B reference point of the User-to-Network Interface of the Broadband Integrated Services Digital Network (B-ISDN). The Connection characteristics negotiation capability defined in this Recommendation enables in particular the negotiation of cell rate traffic parameters using an alternative set of values given in an alternative ATM traffic descriptor information element, or negotiation of cell rate traffic parameters by using a minimum acceptable traffic descriptor information element containing minimum acceptable traffic parameter values.

This revised edition extends the scope of ATM traffic parameter negotiation capability in Q.2962 (1996) to include the possible negotiation of SCR and MBS parameters within a range down to minimum acceptable SCR and MBS parameters values.

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.

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

NOTE

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

INTELLECTUAL PROPERTY RIGHTS

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

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

CONTENTS

DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 2 – CONNECTION CHARACTERISTICS NEGOTIATION DURING CALL/CONNECTION ESTABLISHMENT PHASE

(revised in 1998)

1   Scope

This Recommendation specifies the procedures for negotiation of connection characteristics by means of the Digital Subscriber Signalling System No. 2 (DSS 2) protocol at the T_B reference point or coincident S_B and T_B reference point (as defined in Recommendation I.413) of the Broadband Integrated Services Digital Network (B-ISDN).

This Recommendation specifies the signalling protocol to negotiate the traffic parameters that are specified in Recommendations Q.2931 and Q.2961.1 for basic call/connection control. The capability described in this Recommendation is also applicable for negotiating the connection characteristics for the first party of a point-to-multipoint call/connections as specified in Recommendation Q.2971. The capabilities in this Recommendation are only applicable during the call/connection establishment phase.

This Recommendation is part of the DSS 2 family of ITU-T Recommendations. It specifies extensions to Recommendations Q.2931, Q.2961.1 and Q.2971; it does not repeat states, information elements, messages and procedures contained therein but only specifies extensions related to traffic parameter negotiation.

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.2931 (1995), *Digital Subscriber Signalling System No. 2 (DSS 2) – User Network Interface (UNI) layer 3 specification for basic call/connection control.*

[2]   ITU-T Recommendation Q.2971 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – Digital Subscriber Signalling System No. 2 (DSS 2) – User Network Interface layer 3 specification for point-to-multipoint call/connection control.*

[3]   ITU-T Recommendation I.327 (1993), *B-ISDN functional architecture.*

[4]   ITU-T Recommendation Q.2961.1 (1995), *Digital Subscriber Signalling System No. 2 (DSS 2) – Additional traffic parameters: Additional signalling capabilities to support traffic parameters for the tagging option and the sustainable cell rate parameter set.*

3   Definitions

The definitions of Annex J/Q.2931 [1] apply.

4 Abbreviations

This Recommendation uses the following abbreviations:

ATM   Asynchronous Transfer Mode

B-ISDN   Broadband Integrated Services Digital Network

CLP   Cell Loss Priority

DSS 2   Digital Subscriber Signalling System No. 2

OAM   Operations, Administration and Maintenance

5 Description

This Recommendation specifies the signalling protocol for negotiation of connection characteristics for point-to-point call/connections and for the first party of point-to-multipoint call/connections. The negotiation capabilities are only applicable during the call/connection establishment phase. In particular, the following capabilities are specified:

– negotiation of a set of connection characteristics using an alternative traffic descriptor; and

– negotiation of individual traffic parameters using a minimum traffic descriptor.

In the case of the use of the alternative ATM traffic descriptor information element, the parameters of the information element are handled as a single set whereas the minimum acceptable ATM traffic descriptor information element allows the specification of a range of values for parameters which are then handled independently for the selection of their respective values. The use of both the alternative ATM traffic descriptor information element and the minimum acceptable ATM traffic descriptor information element allows negotiation of any relevant traffic parameters (i.e. peak cell rate, sustainable cell rate and maximum burst size parameters, depending on the ATM transfer capability actually used for the connection).

6 Operational requirements

6.1 Provision and withdrawal

It is a user and a network option to provide the procedures described in this Recommendation. If implemented, the procedures of this Recommendation may be provided as a subscription option to the served user on the origination side.

6.2 Requirements on the originating network side

See 6.1.

6.3 Requirements on the destination network side

See 6.1.

7 Primitive definitions and state definitions

7.1 Primitive definitions

Clause 8/Q.2931 [1] shall apply.

7.2 State definitions

No additional states to those specified in Recommendations Q.2931 [1] and Q.2971 [2] are required.

8 Coding requirements

8.1 Messages

The messages structure, functional definition and information contents are specified according to the rules given in clause 3/Q.2931 [1].

8.1.1 Modification of messages in Recommendation Q.2962

Table 8-1 lists the existing Q.2931 messages that have had their contents modified to support connection characteristics negotiation during the establishment phase of the call/connection.

Table 8-1/Q.2962 – Modified Q.2931 messages

Message	Reference
SETUP	8.1.1.1
CONNECT	8.1.1.2

8.1.1.1 SETUP

This message is sent by the calling user to the network and by the network to the called user to initiate B-ISDN call and connection establishment. See Table 8-2 for additions to the structure of this message shown in Table 3-8/Q.2931 [1] and in 8.1/Q.2961.1 [4].

Table 8-2/Q.2962 – SETUP message additional content

Message type:	SETUP			
Significance:	Global			
Direction:	Both			

Information element	Reference	Direction	Type	Length
Alternative ATM traffic descriptor	8.2.1	Both	O (Note)	4-28
Minimum acceptable ATM traffic descriptor	8.2.2	Both	O (Note)	4-28
NOTE – Either the alternative ATM traffic descriptor information element or the minimum acceptable ATM traffic descriptor information element, but not both, shall be included in the SETUP message when traffic parameters are negotiable.				

8.1.1.2 CONNECT

This message is sent by the called user to the network and by the network to the calling user to indicate call/connection acceptance by the called user. See Table 8-3 for additions to the structure of this message shown in Table 3-2/Q.2931 [1] and in 8.1/Q.2961.1 [4].

Table 8-3/Q.2962 – CONNECT message additional content

Message type:	CONNECT			
Significance:	Global			
Direction:	Both			

Information element	Reference	Direction	Type	Length
ATM traffic descriptor	4.5.6/Q.2931 8.2.1/Q.2961.1	Both	O (Note)	4-30
NOTE – Included to specify the traffic parameter values allocated for the call/connection if one or more traffic parameters were negotiable in the SETUP message.				

8.2 Information elements

8.2.1 Alternative ATM traffic descriptor

The purpose of the alternative ATM traffic descriptor information element is to specify an alternative ATM traffic descriptor for the negotiation of traffic parameters during call/connection setup.

The alternative ATM traffic descriptor information element is coded as shown in Figure 8-1. The maximum length of this information element is 28 octets.

8	7	6	5	4	3	2	1	Octet
Alternative ATM traffic descriptor information element identifier								
1	0	0	0	0	0	1	0	1
ext.	Coding standard		Information element instruction field					
1			Flag	Reserved	Action indicator			2
Length of alternative ATM traffic descriptor contents								3
								4
Further octets as contents of ATM traffic descriptor (Figure 4-13/Q.2931 and Figure 1/Q.2961.1) – Note								5*
								16*

NOTE – The octet group 17 (Traffic management options) in Figure 1/Q.2961.1 [4] is not applicable.

Figure 8-1/Q.2962 – Alternative ATM traffic descriptor information element

The alternative ATM traffic descriptor information element can have any combination of traffic parameters that is allowed for the ATM traffic descriptor information element for the specified ATM transfer capability. Within a single SETUP message, the combination of traffic parameters may be different for these two information elements. The alternative bandwidth requirements must be reduced compared to those originally requested.

8.2.2 Minimum acceptable ATM traffic descriptor

The purpose of the minimum acceptable ATM traffic descriptor information element is to specify the minimum acceptable ATM traffic parameters in the negotiation of traffic parameters during call/connection setup. The minimum acceptable ATM traffic parameters are the lowest values that the user is willing to accept for the call/connection.

The minimum acceptable ATM traffic descriptor information element is coded as shown in Figure 8-2. The maximum length of this information element is 28 octets.

In a SETUP message, a traffic parameter [i.e. forward peak cell rate (CLP = 0), forward peak cell rate (CLP = 0 + 1), backward peak cell rate (CLP = 0), backward peak cell rate (CLP = 0 + 1), forward sustainable cell rate (CLP = 0 + 1), forward sustainable cell rate (CLP = 0), backward sustainable cell rate (CLP = 0 + 1), backward sustainable cell rate (CLP = 0), forward maximum burst size (CLP = 0 + 1), forward maximum burst size (CLP = 0), backward maximum burst size (CLP = 0 + 1) or backward maximum burst size (CLP = 0)] is allowed in the minimum acceptable ATM traffic descriptor information element only if the corresponding traffic parameter is in the ATM traffic descriptor information element of the SETUP message [e.g. if there is no forward peak cell rate (CLP = 0) parameter in the ATM traffic descriptor information element of a SETUP message, then the forward peak cell rate (CLP = 0) is not allowed in the minimum acceptable ATM traffic descriptor information element of the SETUP message].

8	7	6	5	4	3	2	1	Octet
1	0	0	0	0	0	0	1	1
Minimum acceptable ATM traffic descriptor information element identifier								
ext. 1	Coding standard		Information element instruction field					2
			Flag	Reserved	Action indicator			
Length of minimum acceptable ATM traffic descriptor contents								3
								4
Further octets as contents of ATM traffic descriptor (Figure 4-13/Q.2931 and Figure 1/Q.2961.1) – Note								5*
								16*

NOTE – The octet group 17 (Traffic management options) in Figure 1/Q.2961.1 [4] is not applicable.

Figure 8-2/Q.2962 – Minimum acceptable ATM traffic descriptor information element

9 Signalling procedures at the coincident S_B and T_B reference point

9.1 Negotiating the connection characteristics at the origination interface

9.1.1 Negotiation request (originating interface)

The user initiates the negotiation of the connection characteristics by including, in addition to the ATM traffic descriptor information element, either the minimum acceptable ATM traffic descriptor information element or the alternative ATM traffic descriptor information element, but not both, in the SETUP message. In the case of the use of the alternative ATM traffic descriptor information element, the parameters of the information element are handled as a single entity whereas the minimum acceptable ATM traffic descriptor information element allows the specification of a range of values for parameters which are handled independently. If a minimum acceptable ATM traffic descriptor information element is used, the traffic parameter values indicated shall be lesser than the corresponding traffic parameter values specified in the ATM traffic descriptor information element.

If point-to-multipoint procedures are supported, the user may initiate negotiation for the first party of a point-to-multipoint call. If the user initiates negotiation, the user shall send ADD PARTY messages only if the link is in the active state. If an ADD PARTY message is received for a call for which the SETUP message contained either a minimum acceptable ATM traffic descriptor information element or an alternative ATM traffic descriptor information element while in the call delivered state, an ADD PARTY REJECT message with a cause information element indicating cause No. 111, "protocol error, unspecified", shall be sent in response.

9.1.2 Traffic parameter negotiation procedures (originating interface)

When both the minimum acceptable ATM traffic descriptor and the alternative ATM traffic descriptor information elements are present in a SETUP message, the call shall be rejected as specified in 5.4.2/Q.2931 with cause No. 73, "unsupported combination of traffic parameters".

If the parameters of the alternative ATM traffic descriptor information element or minimum acceptable ATM traffic descriptor information element are not according to the allowed combinations as specified in 8.2.1 and 8.2.2 respectively, the network shall handle these information elements as if they were non-mandatory information elements with content error as specified in 5.6.8/Q.2931.

When the minimum acceptable ATM traffic descriptor information element is included in the SETUP message and the network is able to provide the traffic parameter values specified in the ATM traffic descriptor information element, the network shall progress the connection establishment request with both the ATM traffic descriptor information element and the minimum acceptable ATM traffic descriptor information element.

When the alternative ATM traffic descriptor information element is included in the SETUP message and the network is able to provide the traffic parameter values specified in the ATM traffic descriptor information element and the network is able to provide the traffic parameter values specified in the alternative ATM traffic descriptor information element, the network shall progress the call/connection establishment request with both the ATM traffic descriptor information element and the alternative ATM traffic descriptor information element.

When the alternative ATM traffic descriptor information element is included in the SETUP message and the network is able to provide the traffic parameter values specified in the ATM traffic descriptor information element and the network is not able to provide the traffic parameter values specified in the alternative ATM traffic descriptor information element, the network shall progress the call/connection establishment request with the ATM traffic descriptor information element and without the alternative ATM traffic descriptor information element.

If the network is not able to provide some of the traffic parameter values indicated in the ATM traffic descriptor information element and the minimum acceptable ATM traffic descriptor information element is included, the procedures of 9.1.2.1 shall apply.

If the network is not able to provide some of the traffic parameter values indicated in the ATM traffic descriptor information element and the alternative ATM traffic descriptor information element is included, the procedures of 9.1.2.2 shall apply.

When the OAM traffic descriptor information element is present, the allocation of bandwidth for OAM flow is based on the ATM traffic descriptor agreed in the CONNECT message. Since the OAM flow allocation is bidirectional (see Note 2 of Table 4-22/Q.2931), the available user cell rate in one direction can be affected by negotiation of bandwidth in the other direction.

9.1.2.1 Minimum acceptable ATM traffic parameter negotiation

If the network is not able to provide some of the traffic parameter values indicated in the ATM traffic descriptor information element but able to provide at least their corresponding values in the minimum acceptable ATM traffic descriptor information element, the network shall progress the connection establishment request after adjusting the traffic parameter values indication in the ATM traffic descriptor information element. The adjusted parameter values will support at least the corresponding minimum acceptable values. If some of the parameters in the minimum acceptable ATM traffic descriptor information element are still less than the corresponding parameters in the modified ATM traffic descriptor information element, then the call/connection shall be progressed with the minimum acceptable ATM traffic descriptor information element containing all such parameters, in addition to the modified ATM traffic descriptor information element. Otherwise, the call shall progress with the modified ATM traffic descriptor information element and without the minimum acceptable ATM traffic descriptor information element.

If the network is not able to provide at least the traffic parameter values indicated in the minimum acceptable ATM traffic descriptor information element, the network shall reject the connection establishment request, as specified in 5.4.2/Q.2931 with cause No. 37, "user cell rate unavailable".

9.1.2.2 Alternative traffic parameter negotiation

If the network is not able to provide the ATM traffic descriptor indicated in the ATM traffic descriptor information element but able to provide the ATM traffic descriptor indicated in the alternative ATM traffic descriptor information element, the network shall progress the connection establishment request by using the contents of the alternative ATM traffic descriptor information element as the ATM traffic descriptor.

If the network can provide neither the ATM traffic descriptor indicated in the ATM traffic descriptor information element nor the ATM traffic descriptor indicated in the alternative ATM traffic descriptor information element, the network shall reject the connection establishment request, as specified in 5.4.2/Q.2931 with cause No. 37, "user cell rate unavailable".

9.1.3 Negotiation acceptance (originating interface)

Upon receiving an indication that the request has been accepted, the network shall send a CONNECT message across the UNI and enter the active state. The message returned to the user shall contain the ATM traffic descriptor information element indicating the traffic parameter values finally allocated to the connection.

If no ATM traffic descriptor information element is included in the CONNECT message, the connection characteristics specified in the ATM traffic descriptor information element sent in the SETUP message shall apply.

9.2 Negotiating the connection characteristics at the destination interface

9.2.1 Negotiation request (destination interface)

The network shall send a SETUP message containing, in addition to the ATM traffic descriptor information element, either the minimum acceptable ATM traffic descriptor information element or the alternative ATM traffic descriptor information element when traffic parameters are negotiable.

9.2.2 Traffic parameter negotiation procedures (destination interface)

If the user is able to provide the connection characteristics specified in the ATM traffic descriptor information element, the user shall progress the connection establishment request.

If the user is not able to provide some of the traffic parameter values indicated in the ATM traffic descriptor information element and the minimum acceptable ATM traffic descriptor information element is included, the procedures of 9.2.2.1 shall apply.

If the user is not able to provide the ATM traffic descriptor indicated by the ATM traffic descriptor information element and the alternative ATM traffic descriptor information element is included, the procedures of 9.2.2.2 shall apply.

When the OAM traffic descriptor information element is present, the allocation of bandwidth for OAM flow is based on the ATM traffic descriptor agreed in the CONNECT message. Since the OAM flow allocation is bidirectional (see Note 2 of Table 4-22/Q.2931), the available user cell rate in one direction can be affected by negotiation of bandwidth in the other direction.

9.2.2.1 Minimum acceptable traffic parameter negotiation

If the user is not able to provide some of the traffic parameter values indicated in the ATM traffic descriptor information element but is able to provide at least their corresponding values in the minimum acceptable ATM traffic descriptor information element, the user shall progress the connection establishment request.

If the user is not able to provide at least the traffic parameter values indicated in the minimum acceptable ATM traffic descriptor information element, the user shall reject the connection establishment request, as specified in 5.4.2/Q.2931 with cause No. 47, "Resources not available, unspecified".

9.2.2.2 Alternative traffic parameter negotiation

If the user is not able to provide the ATM traffic descriptor indicated by the ATM traffic descriptor information element but is able to provide the ATM traffic descriptor indicated by the alternative ATM traffic descriptor information element, the user shall progress the connection establishment request on the basis of the alternative ATM traffic descriptor information element.

If the user can provide neither the ATM traffic descriptor indicated by the ATM traffic descriptor information element nor the ATM traffic descriptor indicated by the alternative ATM traffic descriptor information element, the user shall reject the connection establishment request, as specified in 5.4.2/Q.2931 with cause No. 47, "Resources not available, unspecified".

9.2.3   Negotiation confirmation (destination interface)

When the user receives a SETUP message and wishes to accept the request, the user responds with a CONNECT message and enters the appropriate connection state. The message returned by the user shall contain the ATM traffic descriptor information element with the accepted connection characteristics. The ATM traffic descriptor information element shall contain the same set of parameters as received in the ATM traffic descriptor information element, if negotiation has proceeded on the basis of the minimum acceptable ATM traffic descriptor information element, or the alternative ATM traffic descriptor information element if this has been used for negotiation.

If no ATM traffic descriptor information element is included in the CONNECT message, the connection characteristics specified in the ATM traffic descriptor information element sent in the SETUP message shall apply.

If the user rejects the request, it will send the appropriate message (RELEASE COMPLETE) and enter the null state.

10   Procedures at the T$_B$ reference point for interworking with private B-ISDNs

The procedures of clause 9 apply.

11   Interworking with other networks

Negotiation procedures are terminated at interworking points with other networks. An interworking unit can apply the procedures of 9.2 in order to obtain an acceptable ATM traffic descriptor to allow interworking to proceed.

12   Interactions with supplementary services

There are no interactions with supplementary services.

13   Parameter values

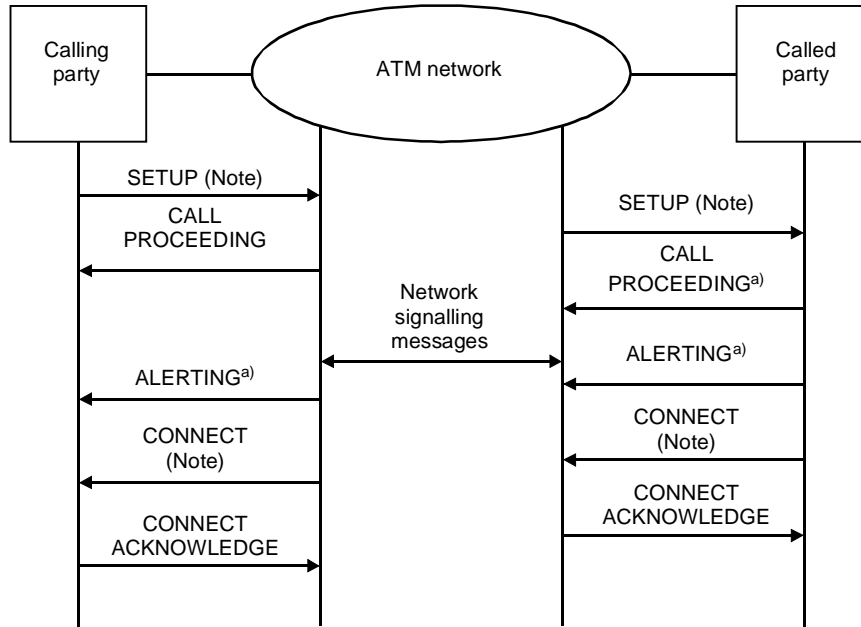None required.

14   Dynamic description (SDLs)

None required.

Appendix I

Message flow diagram for negotiation of traffic parameters at call/connection setup

a) Optional message.

NOTE – Additional information elements are included for negotiation.

**Figure I.1/Q.2962 – Successful ATM connection establishment
with traffic parameter negotiation**

Appendix II

Guidelines for the use of the instruction indicator

It is suggested that the instruction indicator for the alternative ATM traffic descriptor and minimum acceptable ATM traffic descriptor information elements be encoded to indicate "discard, proceed and report status".

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