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SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – B-ISDN application protocols for
access signalling

**Digital Subscriber Signalling System No. 2
(DSS 2) – Signalling specification for Frame
Relay service**

ITU-T Recommendation Q.2933

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.2933

DIGITAL SUBSCRIBER SIGNALLING SYSTEM NO. 2 (DSS 2) – SIGNALLING SPECIFICATION FOR FRAME RELAY SERVICE

Summary

This Recommendation defines the operation of the Digital Subscriber Signalling System Number 2 (DSS 2) for the support of the Frame relay service that may be provided, as a network provider 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 signalling procedures defined in this Recommendation specify only the extensions to Recommendations Q.2931 and Q.2961.1 and do not repeat states, messages, information elements and procedures contained therein.

The signalling procedures defined support only single step Frame relay call/connection control with one ATM virtual connection supporting one frame relay connection.

Source

ITU-T Recommendation Q.2933 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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NOTE

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Recommendation Q.2933

DIGITAL SUBSCRIBER SIGNALLING SYSTEM No. 2 (DSS 2) – SIGNALLING SPECIFICATION FOR FRAME RELAY SERVICE

(Geneva, 1996)

1 Scope

This Recommendation specifies the procedures for the establishing, maintaining and clearing of Broadband Integrated Services Digital Network (B-ISDN) Frame Relaying connections at the User-network interface. These procedures are defined in terms of messages and procedures at the T_B reference point or coincident S_B and T_B (S_B/T_B) reference point as defined in Recommendation I.413 [1] by means of the Digital Subscriber Signalling System No. 2 (DSS 2). The capability specified in this Recommendation also allows the user of the Frame Relaying bearer service to access a frame handler in a B-ISDN.

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

This Recommendation does not cover procedures for the negotiation and modification/renegotiation of traffic parameters.

This Recommendation supports only single step call control with one virtual connection supporting only one frame relay connection. Multiple frame relay switched virtual connections (each identified by a DLCI value at the FR-SSCS level) over a single broadband virtual channel connection is not supported.

Whenever differences exist in procedures, messages and/or information elements, these are clearly pointed out and fully specified. Information elements of Recommendation Q.2931 which are applicable for B-ISDN calls providing Frame Relaying bearer service, but require no enhancements are handled by direct reference to Recommendation Q.2931.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. All 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 references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T Recommendation I.413 (1993), *B-ISDN user-network interface*.
- [2] ITU-T Recommendation Q.2931 (1995), *Digital Subscriber Signalling System No. 2 – User-Network Interface (UNI) layer 3 specification for basic call/connection control*.
- [3] CCITT Recommendation I.233.1 (1991), *Frame mode bearer services: ISDN frame relaying bearer service*.
- [4] ITU-T Recommendation Q.933 (1995), *Signalling specification for frame mode basic call control*.
- [5] ITU-T Recommendation I.365.1 (1993), *B-ISDN ATM adaptation layer sublayers: Frame Relaying Service Specific Convergence Sublayer (FR-SSCS)*.

- [6] ITU-T Recommendation I.361 (1995), *B-ISDN ATM layer specification*.
- [7] 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*.
- [8] ITU-T Q.2951-Series Recommendations (1995), *Stage 3 description for number identification supplementary services using B-ISDN Digital Subscriber Signalling System No.2 (DSS 2) – Basic Call*.
- [9] ITU-T Q.2957-Series Recommendations (1995), *Stage 3 description for additional information transfer supplementary services using B-ISDN Digital Subscriber Signalling System No. 2 (DSS 2) – Basic Call*.
- [10] ITU-T Recommendation I.555 (1993), *Frame relaying bearer service interworking*.

3 Definitions

The definitions of Annex J/Q.2931 [2] apply.

4 Abbreviations

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

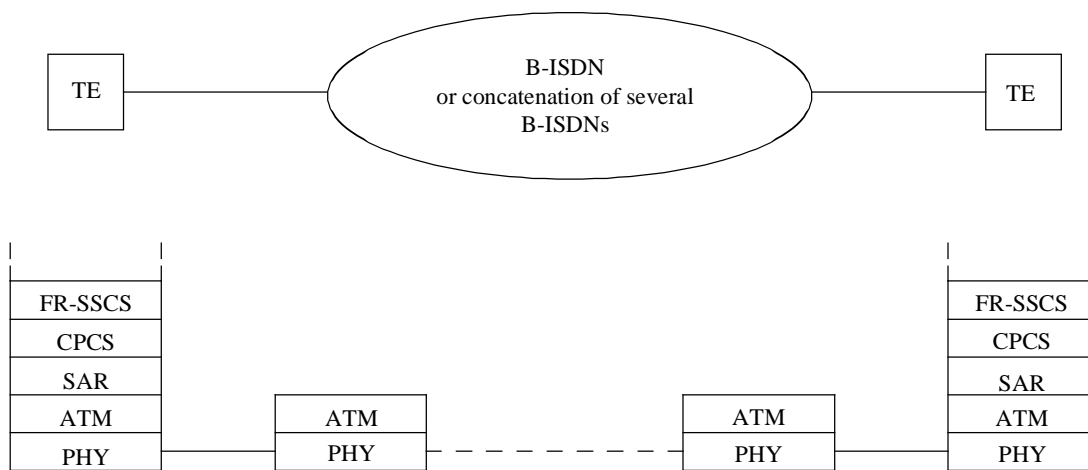
CPCS	Common Part Convergence Sublayer
DLCI	Data Link Connection Identifier
EX	Exchange
FH	Frame Handler
FR-SSCS	Frame Relaying Service Specific Convergence Sublayer
PDN	Public Data Network
PHY	Physical Layer Protocol
SAR	Segmentation and Reassembly

5 Description

The overall description of frame relaying bearer service is specified in Recommendation I.233.1.

The B-ISDN Frame Relaying bearer service provides the bidirectional transfer of Service Data Units (SDUs) with the order preserved. The service is provided to the user by the Frame Relaying Service Specific Convergence Sublayer (FR-SSCS) specified in Recommendation I.365.1 above the AAL Type 5 common part. The FR-SSCS provides the Core services as described in Annex C/I.233.1.

Figure 5-1 shows the communication scenario where a Frame Relaying connection is established between two B-ISDN users.



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Figure 5-1/Q.2933 – Frame Relaying connection established between two B-ISDN users

5.1 General description

The B-ISDN Frame Relaying bearer service has the following characteristics:

- Provides the bidirectional transfer of Service Data Units from T_B or S_B/T_B reference point to another with the order preserved.
- All C-plane procedures are performed in a logically separate manner.
- The U-plane procedures use the services provided by AAL Type 5 common part on a Virtual Channel Connection (VCC) basis and FR-SSCS above it.

6 Operational requirements

6.1 Provision and withdrawal

The additional traffic indications may be included in signalling messages by the user as specified in this Recommendation without any prior arrangement with the service provider.

6.2 Requirements at the originating network side

The procedures according to clause 9 shall apply.

6.3 Requirements at the terminating network side

The procedures according to clause 9 shall apply.

7 Primitive and state definitions

7.1 Primitive definitions

Clause 8/Q.2931 shall apply.

7.2 Call states

See clause 2/Q.2931. No additional call states are defined.

8 Coding requirements

8.1 Messages

No additional messages are specified beyond the ones of 3.1/Q.2931 and Recommendation Q.2961.1.

8.1.1 ALERTING

See 3.1.1/Q.2931.

8.1.2 CALL PROCEEDING

See 3.1.2/Q.2931.

8.1.3 CONNECT

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

Table 1/Q.2933 – CONNECT message additional content

Message type: CONNECT				
Significance: Global				
Direction: Both				
Information element	Reference	Direction	Type	Length
Link layer core parameters	8.3.8	Both	O (Note 1)	4-29
Link layer protocol parameters	8.3.9	Both	O (Note 2)	4-11
NOTE 1 – Included in the user-to-network direction when the responding user received the Link layer core parameters information element in the SETUP message. Included in the network-to-user direction if the responding user included the link layer core parameters information element in the CONNECT message. It is carried transparently by the network.				
NOTE 2 – Included if the responding user wants to return link layer protocol parameters to the calling user. It is carried transparently by the network.				

8.1.4 CONNECT ACKNOWLEDGE

See 3.1.4/Q.2931.

8.1.5 RELEASE

See 3.1.5/Q.2931.

8.1.6 RELEASE COMPLETE

See 3.1.6/Q.2931.

8.1.7 SETUP

This message is sent by the calling user to the network and by the network to the called user to initiate call/connection establishment. See Table 2 for additions to the structure of this message shown in Table 3-8/Q.2931 and Table 8-2/Q.2962.

Table 2/Q.2933 – SETUP message additional content

Message type: SETUP				
Significance: Global				
Direction: Both				
Information element	Reference	Direction	Type	Length
Link layer core parameters	8.3.8	Both	O (Note 1)	4-29
Link layer protocol parameters	8.3.9	Both	O (Note 2)	4-11
NOTE 1 – Included in the user-to-network direction when the calling user wants to indicate the proposed link layer core parameter values for frame relay call/connection. Included in the network-to-user direction if the calling user included the link layer core parameter information element in the SETUP message. It is carried transparently by the network.				
NOTE 2 – Included if the calling user wants to indicate link layer protocol parameters to the called user. It is carried transparently by the network.				

8.1.8 STATUS

See 3.1.8/Q.2931.

8.1.9 STATUS ENQUIRY

See 3.1.9/Q.2931.

8.2 Messages used with global call reference

See 3.3/Q.2931.

8.3 Information Elements

See clause 4/Q.2931. The subclauses which are modified are given in the following subclauses.

8.3.1 Message type (including message compatibility instruction indicator)

Subclause 4.4.1/Q.2931 applies for B-ISDN Frame Relay service with the following exceptions:

- In Table 4-2/Q.2931 (part 1 of 2), the following codepoints are not supported for Frame Relay call control:

Bits								
8	7	6	5	4	3	2	1	
0	0	0	0	1	1	0	1	SETUP ACKNOWLEDGE
0	1	1	1	1	0	1	1	INFORMATION

8.3.2 ATM Adaptation Layer parameters

The B-ISDN Frame Relay user plane procedures use the service provided by ATM Adaptation layer (AAL) Type 5. Subclause 4.5.5/Q.2931 applies with the following exceptions:

Figure 4-12/Q.2931 (parts 2, 3 and 5 of 5) do not apply. AAL information for Type 5 is shown in Figure 8-1.

8	7	6	5	4	3	2	1	Octet
AAL parameters								
0	1	0	1	1	0	0	0	1
Information element identifier								
1	Coding		Flag		Res.	IE Action Ind.		2
ext.	Standard							
Length of AAL parameter contents								3
								4
AAL - Type								5
Forward max. CPCS-SDU size id.								6*
1	0	0	0	1	1	0	0	
Forward max. CPCS-SDU size								6.1*
								6.2*
Backward max. CPCS-SDU size id.								7*
1	0	0	0	0	0	0	1	
Backward max. CPCS-SDU size								7.1*
								7.2*
SSCS-type identifier								8*
1	0	0	0	0	1	0	0	
SSCS - Type								8.1*

Figure 8-1/Q.2933 – AAL parameters information element for B-ISDN Frame Relay service

AAL type (octet 5)

Bits

8	7	6	5	4	3	2	1
<hr/>							
0	0	0	0	0	1	0	1

AAL Type 5

Forward maximum CPCS-SDU size (octets 6.1 and 6.2)

16-bit integer representation of the values between 0 and 65 535. This parameter refers to the forward direction (calling user to called user, see Annex F/Q.2931).

Backward maximum CPCS-SDU size (octets 7.1 and 7.2)

16-bit integer representation of the values between 0 and 65 535. This parameter refers to the backward direction (called user to calling user, see Annex F/Q.2931).

SSCS Type (octet 8.1 for AAL Type 5)

Bits

8	7	6	5	4	3	2	1
<hr/>							
0	0	0	0	0	1	0	0

Frame Relay SSCS

8.3.3 ATM traffic descriptor

See 1.8.2.1/Q.2961.1 [7]. Principles for selection of traffic parameters for a given direction are specified in 1.9.1/Q.2961.1.

8.3.4 Broadband bearer capability

See 4.5.7/Q.2931. The Broadband bearer capability information element for Frame Relaying bearer service is modified as shown in Figure 8-2. The maximum length of this information element is 8 octets.

8	7	6	5	4	3	2	1	Octet
Broadband bearer capability								1
0	1	0	1	1	1	1	0	
information element identifier								2 to 6 (see Figure 4-14/Q.2931)
1	0	1	User information					7* (Note)
ext.	layer id.		Layer 2 protocol					

NOTE – This octet shall be included when interworking with other networks providing frame relay data transfer service is required. Otherwise it is optional.

Figure 8-2/Q.2933 – Broadband bearer capability information for B-ISDN Frame Relay service

The codepoints of broadband bearer capability information is contained in Table 4-8/Q.2931. Modifications to Table 4-8/Q.2931 are shown below:

Bearer Class (octet 5)

Bits					
5	4	3	2	1	
0	0	1	0	1	Frame relaying bearer service

User information layer 2 protocol (octet 7)

Bits					
5	4	3	2	1	
0	1	1	1	1	Core aspects of Annex A/Q.922

8.3.5 Called party number

See 4.5.11/Q.2931 with the following additions:

Numbering plan identifier (octet 3)

Bits				
4	3	2	1	
0	0	1	1	Data numbering plan (Recommendation X.121) (Notes 1 and 2)

NOTE 1 – When used, the Type of number field shall be coded International Number.

NOTE 2 – The support of this codepoint is a network option and requires bilateral agreement at subscription time. It can be used only to provide interworking of Frame Relay services which are provided on both E.164 numbering plan based networks and X.121 based numbering plan networks when the supporting network also provides an Interworking Function (IWF) with the accessed Public Data Network (PDN) which provides Frame Relay Data Transmission Service (FRDTS). This codepoint is only provided for the purposes of interworking and does not imply that B-ISDN networks may be numbered under X.121. When the NPI field is set to X.121, it allows the selection of a route towards an E.164/X.121 IWF, without requiring knowledge of the X.121 numbering plan by the B-ISDN supporting network. For example, selection of different X.121 numbering plan based networks can be performed by the IWF, based on the X.121 called address, or performed on the basis of subscription pre-arrangements. This numbering capability is not supported SS No. 7 capabilities.

8.3.6 Calling party number

See 4.5.13/Q.2931 with the following additions:

Numbering plan identifier (octet 3)

Bits	
4 3 2 1	
0 0 1 1	Data numbering plan (Recommendation X.121) (Notes 1 and 2)

NOTE 1 – When used, the Type of number field shall be coded International Number.

NOTE 2 – Network option use to identify call originators from an X.121 numbering plan based network. This numbering capability is not supported SS No. 7 capabilities.

8.3.7 Notification Indicator

Subclause 4.5.23/Q.2931 is not applicable for B-ISDN Frame Relay service.

8.3.8 Link layer core parameters

The purpose of the Link layer parameters information element is to indicate requested core service quality parameter values to be used for the frame relay call. The link layer core parameters is transferred transparently through the B-ISDN. See Figure 8-3.

	8	7	6	5	4	3	2	1	Octet
Link layer core parameters									
0 1 0 0 1 0 0 0									1
information element identifier									
	1	Coding							2
ext.	Standard	Flag	Res.	IE Action Ind.					
Length of link layer core parameters contents									3
Further contents as described in Fig. 4-4/Q.933									4
and in Table 4-5/Q.933									5

Figure 8-3/Q.2933 – Link layer core parameters for B-ISDN Frame Relaying bearer service

8.3.9 Link layer protocol parameters

The purpose of the Link layer protocol parameters information element is to indicate requested layer 2 parameter values for the link layer elements of procedures to be used for the call. The link layer protocol parameters is transferred transparently through the B-ISDN. See Figure 8-4.

8	7	6	5	4	3	2	1	Octet
Link layer protocol parameters								
0	1	0	0	1	0	0	1	1
information element identifier								
1	Coding		Flag		Res.	IE Action Ind.		2
ext.	Standard							
Length of link layer protocol parameters contents								3
Further contents as described in Fig. 4-5/Q.933								4
and in Table 4-6/Q.933								5

**Figure 8-4/Q.2933 – Link layer protocol parameters for B-ISDN
Frame Relaying bearer service**

9 Signalling procedures at the coincident S_B and T_B reference point

This clause describes the signalling procedures in support of Frame Relaying bearer service in B-ISDN. The procedures for basic call/connection control as defined in clause 5/Q.2931 [2] shall apply. These procedures apply only to point-to-point access configuration.

The calling party initiates call establishment as specified in 5.1/Q.2931 and 5.2/Q.2931. The procedures employed are identical to those defined in Recommendation Q.2931 with the following additions:

- 1) The structure of the connection control messages exchanged shall be as shown in 8.1, and the information elements carried by these messages be coded in accordance with 8.3.
- 2) Traffic parameter selection shall be as specified in 8.3.3.
- 3) The ATM Adaptation layer parameter indication and negotiation procedures are supported as described in Annex F/Q.2931. These procedures provide negotiation of maximum frame relay information field size.
- 4) The Broadband low layer information element is included when the calling user wants to pass compatibility information to the called user. When Broadband low layer information is required, procedures described in Annex C/Q.2931 shall be followed.
- 5) The rules for selection of traffic parameters for a given direction are specified in 1.9.1/Q.2961.1.
- 6) If used as an option, the procedures for traffic parameter negotiation during the call/connection set-up as specified in Recommendation Q.2962 shall be followed.

9.1 Handling of error conditions

See 5.6/Q.2931, 5.7/Q.2931 and 5.8/Q.2931. In addition see 1.9.3/Q.2961.1.

9.2 Notification procedure

The Notification procedure specified in 5.9/Q.2931 does not apply for B-ISDN Frame Relay call control.

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

The procedures of clause 9 shall apply.

11 Interworking with other networks

11.1 Interaction with entities which do not support the Q.2933 capabilities

If an entity which does not support the capabilities described in this Recommendation receives a SETUP message with the additional fields defined in 8.1.7, it shall follow the procedures described in 5.6/Q.2931, 5.7/Q.2931 and 5.8/Q.2931 [2].

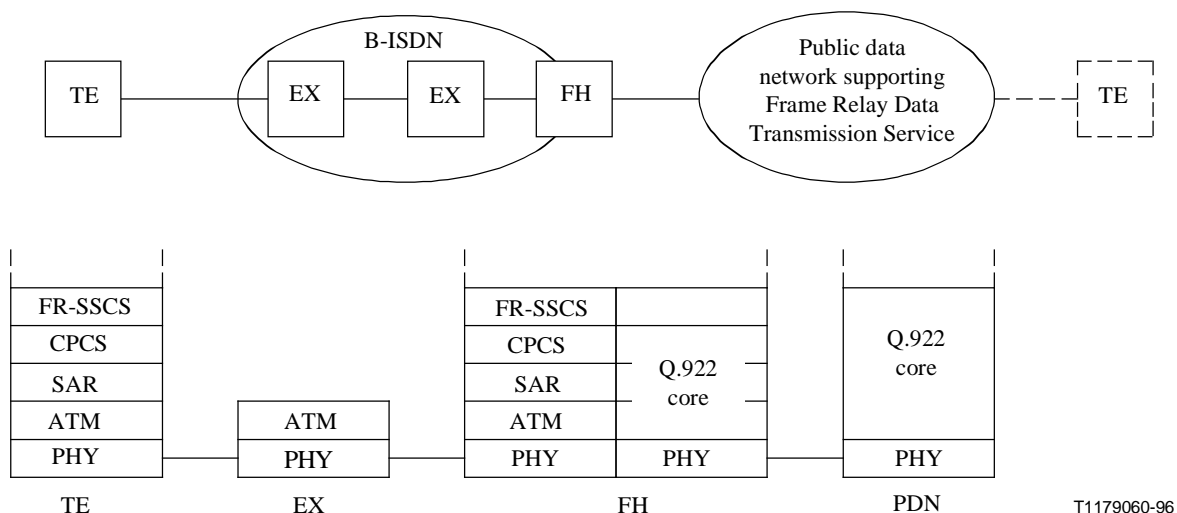
If the entity which does not support the capabilities described in this Recommendation receives a SETUP message with a broadband bearer capability information element with the fields coded as specified in 8.3.4, it shall follow the procedures described in 5.1.5/Q.2931 and 5.2.2.2/Q.2931 [2], i.e. the call shall be rejected.

11.2 Interworking with N-ISDN

See Recommendation I.555 for interworking with N-ISDN Frame Relay service. The network interworking scenarios are described in 7.2.3.2/I.555.

11.3 Interworking with PDNs which support the Frame Relay Data Transmission Service

Figure 11-1 shows the scenario for interworking with a PDN supporting the Frame Relay Data Transmission Service.



NOTE – The frame handler may reside in the B-ISDN local exchange, or may reside elsewhere in the B-ISDN. The most general case is shown in this figure.

Figure 11-1/Q.2933 – Frame Relaying connection between a B-ISDN user and a PDN user

The interworking between the DSS 2 protocol and the protocol described in Recommendation Q.922 is outside the scope of this Recommendation.

12 Interactions with supplementary services

The support of the capabilities covered by this Part have no impact on the support of CLIP, CLIR, COLP, COLR, DDI, SUB, UUS, and MSN supplementary services as specified in the Q.2951-Series Recommendations [8] and Q.2957-Series Recommendations [9].

13 Parameter values

Not applicable for this Recommendation.

14 Dynamic description (SDLs)

See Annex A/Q.2931.

15 B-ISDN Frame Relay data transfer phase protocol

Since only one to one mapping is supported for Frame Relaying connection over an ATM virtual connection in the scope of this Recommendation, a default DLCI value of 1022 shall be used (i.e. the DLCI value need not to be identified in the call/connection control messages at call set-up time).

Upon establishing the B-ISDN Frame Relaying connection, using the procedures specified in clause 9, the frame relay data transfer phase procedures in Recommendation I.365.1 (FR-SSCS) shall be followed.

User information is exchanged with the FR-SSCS by using the primitives as defined in Recommendation I.365.1.

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