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SERIES Q: SWITCHING AND SIGNALLING

Broadband ISDN – B-ISDN application protocols for access signalling

Broadband integrated services digital network (B-ISDN) – Digital subscriber signalling No. 2 (DSS2) – Bearer control protocol

ITU-T Recommendation Q.2983

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.2983

BROADBAND INTEGRATED SERVICES DIGITAL NETWORK (B-ISDN) – DIGITAL SUBSCRIBER SIGNALLING No. 2 (DSS2) – BEARER CONTROL PROTOCOL

Summary

This Recommendation belongs to the DSS2 family of ITU-T Recommendations and specifies extensions to Recommendation Q.2931 to specify the additional DSS2 protocol elements (messages, information elements, procedures and functions) required to support the separated control (establishment, modification, clearing) of bearers associated to a call controlled independently by means of a separated call control protocol. The separated call control protocol may be either the generic functional protocol-based separated call control protocol defined in Recommendation Q.2981 or the Q.2931-based separated call control protocol defined in Recommendation Q.2982.

Source

ITU-T Recommendation Q.2983 was prepared by ITU-T Study Group 11 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on 3 December 1999.

Keywords

Bearer control, call control, separation.

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.

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As of the date of approval of this Recommendation, the ITU had 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.

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Recommendation Q.2983

BROADBAND INTEGRATED SERVICES DIGITAL NETWORK (B-ISDN) – DIGITAL SUBSCRIBER SIGNALLING No. 2 (DSS2) – BEARER CONTROL PROTOCOL

(Geneva, 1999)

1 Scope

This Recommendation specifies a signalling protocol for the purpose of bearer control at the B-ISDN user-network interface. The protocol operates between two adjacent bearer control entities.

This Recommendation specifies the essential features, procedures, and messages required for controlling bearers associated to calls in a functionally separated call and bearer control environment.

The procedures specified by this Recommendation are applicable at the T_B reference point or coincident S_B and T_B reference point as defined in Recommendation I.413 [1] by means of the Digital Subscriber Signalling System No. 2 (DSS2).

The bearer control protocol defined by this Recommendation is applicable to control bearers associated to a call which is controlled independently by means of a separated call control protocol.

NOTE – The separate call control protocol may be either the generic functional protocol-based separated call control protocol defined by Recommendation Q.2981 [2] or the Q.2931-based separated call control protocol defined by Recommendation Q.2982 [3].

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.413 (1993), *B-ISDN user-network interface*.

[2] ITU-T Recommendation Q.2981 (1999), *Broadband integrated services digital network (B-ISDN) and broadband private integrated services network (B-PISN) – Call control protocol.*

[3] ITU-T Recommendation Q.2982 (1999), *Broadband integrated services digital network (B-ISDN) – Digital subscriber signalling system No. 2 (DSS2) – Q.2931-based separated call control protocol.*

[4] ITU-T Recommendation Q.2931 (1995), *Digital subscriber signalling system No. 2 – User-network interface (UNI) layer 3 specification for basic call/connection control.*

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

[6] ITU-T Recommendation Q.2130 (1994), *B-ISDN signalling ATM adaptation layer – Service specific coordination function for support of signalling at the user-network interface (SSCF at UNI).*

[7] ITU-T Recommendation Q.2961.1 (1995), *Digital subscriber signalling system No. 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 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.*

[9] 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.*

[10] 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.*

[11] ITU-T Recommendation Q.2961.5 (1999), *Digital subscriber signalling system No. 2: Additional traffic parameters: DSS2 additional traffic parameters for cell delay variation tolerance indication.*

[12] ITU-T Recommendation Q.2961.6 (1998), *Digital subscriber signalling system No. 2 – Additional traffic parameters: Additional signalling procedures for the support of the SBR2 and SBR3 ATM transfer capabilities.*

[13] ITU-T Recommendation Q.2965.1 (1999), *Digital subscriber signalling system No. 2 – Support of quality of service classes.*

[14] ITU-T Recommendation Q.2962 (1998), *Digital subscriber signalling system No. 2 – Connection characteristics negotiation during call/connection establishment phase.*

[15] ITU-T Recommendation Q.2963.1 (1996), *Digital subscriber signalling system No. 2 – Connection modification: Peak cell rate modification by the connection owner.*

[16] ITU-T Recommendation Q.2963.2 (1997), *Digital subscriber signalling system No. 2 – Connection modification: Modification procedures for sustainable cell rate parameters.*

[17] ITU-T Recommendation Q.2963.3 (1998), *Digital subscriber signalling system No. 2 – Connection modification: ATM traffic descriptor modification with negotiation by the connection owner.*

3 Definitions

This Recommendation defines the following terms:

3.1 bearer state: State for each bearer (see 7.2) which is known by the layer 3 Bearer Control (BC) entity. The different bearer states correspond to the call/connection states defined in clause 2/Q.2931 [4], i.e. the states of the Q.2931 protocol entities on both sides of the UNI and relate to each call-associated bearer.

3.2 bearer: A connection for the transport of user plane information between users involved in a call.

3.3 bearer control: Functionality and signalling in and between networks and terminals to effect the control of a bearer, that bearer being part of a call.

3.4 bearer control entity (BC entity): An entity that is located in a terminal or a network and that participates in bearer control.

3.5 call: An association between two or more users using a telecommunication service to communicate through one or more networks.

3.6 call control: Functionality and signalling in and between networks and terminals to effect the control of a call.

3.7 call control entity (CC entity): An entity that is located in a terminal or a network and that participates in call control.

3.8 bearer identifier: The identifier used to identify a bearer instance to which a particular bearer establishment request relates between two CC entities. The value of the bearer identifier is significant between two adjacent CC entities. The value is unique within a call between two adjacent CC entities.

3.9 call association: The identifier used to identify a call instance to which a particular bearer establishment request relates between two CC entities. The value of a call identifier is significant between two adjacent call control entities. The value carried in the call association is significant between two adjacent CC entities.

3.10 preceding side: With respect to a given bearer, the side of a user-network interface from which bearer establishment across the interface originates.

3.11 succeeding side: With respect to a given bearer, the side (opposite to the preceding side) of a user-network interface which receives bearer establishment request across the interface.

4 Abbreviations

This Recommendation uses the following abbreviations:

ATM	Asynchronous Transfer Mode
B-ISDN	Broadband Integrated Services Digital Network
DSS2	Digital Subscriber Signalling System No. 2
QoS	Quality of Service
SAAL	Signalling ATM Adaptation Layer
SDL	Specification and Description Language
TE	Terminal Equipment (see Recommendation I.327 [5])
UNI	User-Network Interface

5 Description

5.1 Application to interface structure

The bearer control procedures apply to the interface structures defined in Recommendation I.413 [1]. They use the functions and services provided by layer 2 (i.e. the SAAL). The layer 3 procedures request the services of layer 2 and receive information from layer 2 using the primitives defined in Recommendation Q.2130 [6]. These primitives are used to illustrate the communication between the protocol layers and are not intended to specify or constrain implementations.

5.2 Capabilities supported by this Recommendation

This Recommendation builds upon the basic point-to-point combined call/bearer control protocol defined in Recommendation Q.2931 [4] for DSS2 (see 1.5/Q.2931) to enable the separated control of bearers being associated to a call.

5.3 General overview

This Recommendation provides the procedures, messages and information elements needed for establishing, maintaining and clearing of bearers being associated to a call.

After a call has been initiated or has progressed to the active state, bearers can be added to the call by individual bearer establishment requests from the calling party or the called party, using the bearer control protocol specified in this Recommendation, which are based on the procedures in Recommendation Q.2931 [4]. Each new bearer establishment request shall use a new call reference (see clause 4/Q.2931). Bearers may be established or released from the call at any time while not modifying the call state. New bearers can be established by the calling party or the called party by sending a SETUP message as defined in Recommendation Q.2931, which in addition contains the call association information element in order to associate that bearer to the call. Bearers can be released from the call by the calling party or the called party by sending a RELEASE message as defined in Recommendation Q.2931.

The individual bearers are controlled independently. In particular, multiple bearer establishment requests may be initiated in parallel (i.e. the requesting party does not need to wait for a response related to one bearer establishment request before issuing another one). Similarly, multiple bearer release requests may be pending at the same time (i.e. the requesting party does not need to wait for a response related to one release bearer request before issuing the next one).

Any ATM transfer capability available at the interface may be requested independently for each of the bearers associated to a call, using appropriate connection characteristics parameters indication as specified in the Q.2961 series of Recommendations (see [7], [8], [9], [10], [11] and [12]). Any QoS class available at the interface may be requested independently for each of the bearers associated to a call, using appropriate QoS class indication as specified in Recommendation Q.2965.1 [13]. Furthermore, the ATM traffic parameter negotiation features defined in Recommendation Q.2962 [14] apply independently to each bearer at establishment time, as well as ATM traffic parameter modification during the active state of the bearer do, using the features defined in the Q.2963 series of Recommendations (see [15], [16] and [17]).

6 Operational requirements

6.1 Provision and withdrawal

A bilateral agreement between the user and the network provider concerning the availability of the separated call and bearer capabilities is assumed to exist. This may be the subject of a subscription option or may be made generally available.

6.2 Requirements on the originating network side

None beyond the support of the separated call and bearer capability related control protocols.

6.3 Requirements on the destination network side

None beyond the support of the separated call and bearer capability related control protocols.

7 Primitive definitions and state definitions

7.1 Primitive definitions

Clause 8/Q.2931 shall apply. No additional primitives between DSS2 layer 3 and the signalling ATM adaptation layer are defined for the purpose of this Recommendation.

7.2 Bearer state definitions

The bearer states that may exist on the user or network side of the user-network interface coincide with the call/connection states defined in clause 2/Q.2931. The Bearer Control (BC) entity maintains the current state of each individual bearer independently.

The bearer states defined in 2.2/Q.2931 (corresponding to the additional call/connection states) relating to interworking requirements are not applicable although they may be available if the point-to-point combined call/bearer control capability (using the Q.2931 basic call control protocol [4]) inter-working with existing services or networks (i.e. operating exclusively the combined call/bearer control protocol) is supported. However, such interworking requirements are beyond the scope of the present Recommendation.

8 Coding requirements

8.1 Messages

Messages are defined in accordance with the principles given by the introductory paragraph in clause 3/Q.2931. Only changes to messages defined in clause 3/Q.2931 are specified in this subclause.

8.1.1 Modification to messages defined in Q.2931

The following modifications apply to the messages defined in 3.1/Q.2931. However, they do not apply, unless otherwise explicitly stated, to the messages relating to the support of 64 kbit/s-based ISDN circuit mode services (see 3.2/Q.2931) even if the interworking of the separated call and bearer capability with these services (or interworking with networks providing these services) is supported.

Table 8-1 lists the existing clause 3/Q.2931 messages that have their contents modified to support the establishment/release of bearers in a call control environment by means of separated call and bearer control protocols.

Table 8-1/Q.2983 – Modified Q.2931 messages

Message	Reference
SETUP	8.1.1.1

8.1.1.1 SETUP

This message is sent by the user to the network and by the network to the user to initiate an individual bearer establishment.

See Table 8-2 for additions to the structure of this message shown in Table 3-8/Q.2931.

Table 8-2/Q.2983 – SETUP message additional contents

Message type: SETUP Significance: Global Direction: Both				
Information element	**Reference**	**Direction**	**Type**	**Length**
Call association	8.2.1	both	O (Note)	8-9
Bearer identifier	8.2.2	both	O (Note)	7
NOTE – Mandatory when the message is used to add a bearer to a call.				

8.1.1.2 Other messages

If interworking between services supported in a separated call and bearer control environment and 64 kbit/s-based ISDN circuit mode services is supported, the messages defined in 3.2/Q.2931 apply. In addition the SETUP ACKNOWLEDGE (see 3.2.8/Q.2931) message and the INFORMATION message (see 3.2.4/Q.2931) is not applicable although they may be used to support the Q.2931 combined call/connection control capability at the same interface.

8.2 Information elements

The information elements and coding rules of 4.1/Q.2931, 4.2/Q.2931, 4.3/Q.2931, 4.4/Q.2931, and 4.5/Q.2931 shall apply with the additions or modifications identified in the following subclauses.

8.2.1 Call association

The purpose of the call association information element is to identify the call to which the bearer in the process of being established relates. The call identifier value carried in the call association information element has significance between the two peer call control entities between which the bearer is being established.

NOTE – The assignment of the call association value is initiated by the originating side of the first message referring to the establishment of the call.

The call association information element is coded as shown in Figure 8-1 and Table 8-3.

8	7	6	5	4	3	2	1	Octets
Call association								
1	0	0	1	0	0	1	1	1
Information element identifier								
ext. 1	Coding standard		IE instruction field					2
			Flag	Res.	IE action ind			
Length of call association contents								3
Length of call association contents (continued)								4
Identifier for Call identifier value								5
0	0	0	0	0	0	0	1	
Call identifier value								5.1 to 5.3
or								
Identifier for Call segment identifier value								6
0	0	0	0	0	0	1	0	
Call segment identifier value								6.1 to 6.4

Figure 8-1/Q.2983 – Call association information element

Table 8-3/Q.2983 – Call association information element coding

- Octets 1 through 4 are coded according to the coding rules specified in clause 4/Q.2931. Either a call identifier (octet group 5) or a call segment identifier (octet group 6) shall be included but not both. This depends on the method of call identification employed in the related call control protocol.
- The call identifier value field (octets 5.1 to 5.3), if present, contains the call identifier value if provided by the associated CC entity.
- The call segment identifier value field (octets 6.1 to 6.4), if present, contains the call segment identifier value if provided by the associated CC entity.

8.2.2 Bearer identifier

The purpose of the bearer identifier information element is to relate a bearer in the process of being established to a bearer object known to peer call control entities within the context of a call. The bearer identifier value has significance only between the two peer call control entities between which the bearer is being established.

The bearer identifier information element is coded as shown in Figure 8-2 and in Table 8-4.

8	7	6	5	4	3	2	1	Octets
Bearer identifier								
1	0	0	1	0	0	0	1	1
Information element identifier								
ext. 1	Coding standard		IE instruction field					2
			Flag	Res.	IE action ind			
Length of bearer identifier contents								3
Length of bearer reference contents (continued)								4
0/1 bearer identi-fier flag	Bearer identifier value							5
Bearer identifier value (continued)								6
Bearer identifier value (continued)								7

Figure 8-2/Q.2983 – Bearer identifier information element

Table 8-4/Q.2983 – Bearer identifier information element coding

– Octets 1 through 4 are coded according to the coding rules specified in clause 4/Q.2931 [4].

– Bearer identifier flag (octet 5)

Bit

8

0 The message is sent from the side that originated the bearer reference.

1 The message is sent to the side that originated the bearer reference.

– Bearer identifier value (octets 5, 6 and 7)

The bearer identifier is a 23-bit integer (coded in binary) to uniquely identify a bearer within a call.

8.2.3 Other information elements

The broadband sending complete information element (see 4.5.21/Q.2931) is not applicable. However, its use is optional and its presence or absence in the SETUP message shall not incur an error situation.

The information elements defined for the support of 64 kbit/s-based ISDN circuit mode services (see 4.6/Q.2931) apply only when their interworking with services supported in a separated call and bearer control environment is provided.

9 Signalling procedures at the coincident S_B and T_B reference point

9.1 Introduction

Before the procedures described in this subclause are invoked, an assured mode SAAL connection shall be established as specified in 5.1/Q.2931 [4] and clause 8/Q.2931 [4].

The procedures specified in this subclause cover the following capabilities:

a) addition of bearers to call being established or having progressed to the active state;

b) release of bearers from an existing call, while maintaining the call active, including when no more bearer exists.

NOTE – Any of the users may initiate bearer establishment or clearing.

The procedures for basic (and simultaneous) call/connection control as defined in clause 5/Q.2931 [4] shall apply as the basis for the separated bearer control. Only additional procedures required to handle the separated bearer control functions of a call are described in the following subclauses.

9.2 Establishment of a bearer

As soon as the call has been initiated and the initiating call control entity has received an indication that call establishment is proceeding, one or more bearer addition to the call may be initiated.

9.2.1 Additional procedures at a preceding side

When sending a SETUP message, a preceding side that is a point of call/bearer coordination shall place in the called party number information element the called party number supplied by the call control signalling service user.

The Bearer Control (BC) entity requesting the addition of a bearer to a call shall send a SETUP message with a new call reference and containing a call association information element specifying the call to which the bearer establishment request relates.

The SETUP message shall contain the called party number and called party subaddress information element containing addresses provided by the Call Control (CC) entity.

The Bearer Control (BC) entity receiving a SETUP message specifying a call association value which is not recognized as relating to an existing call, shall reject the bearer establishment request by sending a RELEASE COMPLETE message with cause #101, *"message not compatible with call state*".

Upon receipt of an indication that the bearer establishment request has been accepted and proceeds, the network shall associate the bearer (identified by the call reference in the received message) to the call (identified by the value carried in the call association information element).

9.2.1.1 Additional procedures at a preceding side that is a point of call/bearer coordination

When sending a SETUP message, a preceding side that is a point of call/bearer coordination shall place in the called party number information element the called party number supplied by the local call control signalling service user.

It shall also include in the SETUP message a call association information element containing a call identifier value or a call segment identifier value supplied by the local call control signalling service user.

In addition, it shall include in the SETUP message a bearer identifier information element containing a bearer identifier value supplied by the local call control signalling service user.

9.2.1.2 Additional procedures at a preceding side that is not a point of call/bearer coordination

When sending a SETUP message, a preceding side that is not a point of call/bearer coordination shall place in the called party number information element the called party number received in the bearer establishment request from the previous point of call/bearer coordination.

It shall also include in the SETUP message a call association information element containing a call identifier value or a call segment identifier value that has been received in the bearer establishment request message from the previous point of call/bearer coordination.

In addition, it shall include in the SETUP message a bearer identifier information element contained in the bearer establishment request message received from the previous point of call/bearer coordination.

9.2.2 Additional procedures at a succeeding side

Upon receipt of a SETUP message containing a call association information element, the succeeding side shall determine whether it is the point of call/bearer coordination addressed by the called party number information element. If so, the procedures of 9.2.2.2 shall apply; otherwise, the procedures of 9.2.2.1 shall apply.

9.2.2.1 Additional procedures at a succeeding side that is not a point of call/bearer coordination

A succeeding side that is not a point of call/bearer coordination shall forward the bearer establishment request based on information in the received SETUP message towards the next point of call/bearer coordination, as addressed by the number in the received called party number information element.

It shall also pass forward in the SETUP bearer establishment request message towards the next point of call/bearer coordination the call identifier value or the call segment identifier value received in the call association information element present in the received SETUP message.

In addition, it shall pass forward in the SETUP bearer establishment request message towards the next point of call/bearer coordination the bearer identifier value received in the bearer identifier information element.

9.2.2.2 Additional procedures at a succeeding side that is a point of call/bearer coordination

A succeeding side that is a point of call/bearer coordination shall forward the bearer establishment request based on information in the received SETUP message to the local call control signalling service user.

It shall also pass to the local call control signalling service user the call identifier value or the call segment identifier value received in the call association information element present in the received SETUP message.

NOTE 1– The call control service user can use this value to relate the bearer to an existing call. Failure to relate the bearer to an existing call can result in a rejection by the call control signalling service user of the bearer being requested to be established.

In addition, it shall pass to the local call control signalling service user the bearer identifier value in the bearer identifier information element.

NOTE 2 – The call control service user can use this value to correlate the bearer against the call's object model. Failure to correlate can result in the call control signalling service user to reject the bearer being requested to be established.

9.3 Clearing of a connection

Clearing procedures as specified in 5.4/Q.2931 shall apply. Clearing of a bearer does not affect the call state.

NOTE – The bearer clearing message does not contain the call association information element.

10 Signalling procedures at the T_B reference point

Clause 9 applies.

11 Interworking with other networks

Interworking with user or network entities not supporting the separated call and bearer capability is an implementation option. The interworking specifications are beyond the scope of the present Recommendation.

NOTE – If supported, the interworking function shall map each bearer of a separated call to a call/connection in networks not supporting the separated call and bearer capability.

12 Interactions with supplementary services

Beyond the scope of the present Recommendation.

13 Parameter values

No additional parameter required in addition to those defined in Recommendation Q.2931.

14 Dynamic description SDLs

None required beyond those in Annex A/Q.2931.

APPENDIX I

Guidelines for the use of the instruction indicator

This appendix provides guidelines for the setting of the instruction indicator field in the call association and bearer identifier information elements. An implementation may choose to set the instruction indicator differently, depending on possible specific requirements beyond those covered explicitly within the present Recommendation.

Recommended setting of the instruction indicator in the call association information element:

Flag: "ignore explicit instructions"

Action indicator: "not significant"

Recommended setting of the instruction indicator in the bearer identifier information element:

Flag: "ignore explicit instructions"

Action indicator: "not significant"

APPENDIX II

Significance and use of the bearer identifier and call association at the user-network interface

This appendix provides further information on the use of the bearer identifier value included in the bearer identifier information element to enable the association of a bearer to a call through the use of the call identifier or call segment identifier value contained in the call association information element.

Figure II.1 shows the peer-to-peer call and bearer control elements at the user-network interface and their relationships.

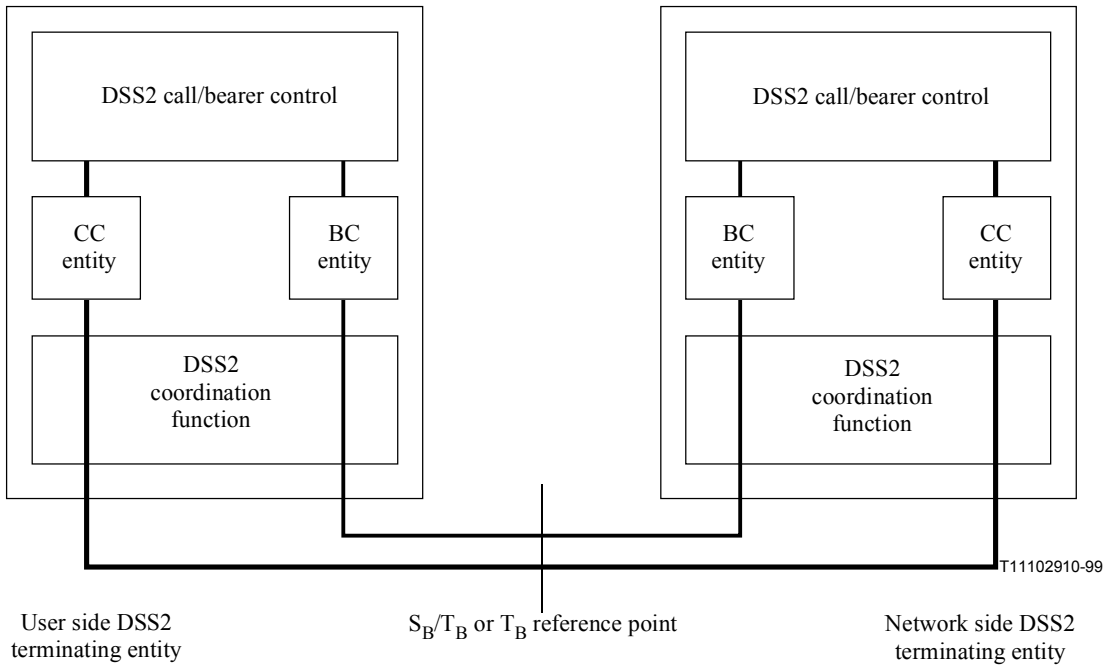

Figure II.1/Q.2983 – Call and bearer control elements relationships at UNI

The call identifier or the call segment identifier value provides the means to establish the required association between corresponding peer call object instances and the bearer identifier value is used to explicitly associate corresponding peer bearer object instances at each side of the user-network interface.

The call state machine is maintained by the CC entity. Each call state machine instance is identified by the call identifier or the call segment identifier, depending on the separated call control protocol used to operate the call.

The bearer state machine is maintained by the BC entity. Each bearer state machine instance is identified by the bearer identifier.

The call/bearer coordination function uses the call identifier or the call segment identifier value contained in the call association information element in the received bearer establishment SETUP message to relate the bearer, identified by the bearer identifier value, with an existing call.

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