



INTERNATIONAL TELECOMMUNICATION UNION

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**Q.765.5**

(04/2004)

SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – ISDN user part

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**Signalling system No. 7 – Application transport  
mechanism: Bearer Independent Call Control  
(BICC)**

ITU-T Recommendation Q.765.5

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## **ITU-T Recommendation Q.765.5**

### **Signalling system No. 7 – Application transport mechanism: Bearer Independent Call Control (BICC)**

#### **Summary**

This Recommendation describes the extensions required for the transport of bearer-related information associated with the Bearer Independent Call Control (BICC) as defined in ITU-T Rec. Q.1902.1. The BICC is used to manage the call control instance that has been separated from the bearer control instance. The BICC needs to transport bearer-related information between call control instances. The Application Transport Mechanism (APM) (see ITU-T Recs Q.1902.5 and Q.1902.1) will be used for this purpose. This Recommendation specifies the APM-user to support the transport of the bearer-related information for the BICC.

#### **Source**

ITU-T Recommendation Q.765.5 was approved on 13 April 2004 by ITU-T Study Group 11 (2001-2004) under the ITU-T Recommendation A.8 procedure.

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# ITU-T Recommendation Q.765.5

## Signalling system No. 7 – Application transport mechanism: Bearer Independent Call Control (BICC)

### 1 Scope

This Recommendation describes the extensions required for the transport of bearer-related information associated with the Bearer Independent Call Control (BICC) [3]. The BICC is used to manage the call control instance that has been separated from the bearer control instance. The BICC needs to transport bearer-related information between call control instances. The Application Transport Mechanism (see [1] and [3]) will be used for this purpose. This Recommendation specifies the APM-user to support the transport of the bearer-related information for the BICC.

### 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; 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. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [1] ITU-T Recommendation Q.1902.5 (2001), *Bearer Independent Call Control protocol (Capability Set 2): Exceptions to the application transport mechanism in the context of BICC*.
- [2] ITU-T Recommendation Q.1400 (1993), *Architecture framework for the development of signalling and OA&M protocols using OSI concepts*.
- [3] ITU-T Recommendation Q.1902.1 (2001), *Bearer Independent Call Control protocol (Capability Set 2): Functional description*.
- [4] ITU-T Recommendation X.213 (2001) | ISO/IEC 8348:2002, *Information technology – Open Systems Interconnection – Network service definition, plus Amendment 1 (1997): Addition of the Internet protocol address format identifier*.
- [5] ITU-T Recommendation Q.1990 (2001), *BICC bearer control tunnelling protocol*.
- [6] ITU-T Recommendation E.182 (1998), *Application of tones and recorded announcements in telephone services*.
- [7] ITU-T Recommendation Q.1902.3 (2001), *Bearer independent call control protocol (Capability Set 2) and Signalling System No. 7 ISDN user part: Formats and codes*.

### 3 Definitions

This Recommendation defines the following terms:

**3.1 bearer independent call control (BICC):** The term Bearer Independent Call Control is used to refer to the application of the narrow-band ISDN User Part as defined in the Scope of ITU-T Rec. Q.1902.1 [3].

**3.2 call mediation node (CMN):** A functional entity which provides call service functionality without an associated bearer control function entity.

**3.3 gateway serving node (GSN):** A functional entity which provides gateway functionality between two network domains. This functional entity contains the call service gateway function, and one or more bearer interworking functions. GSNs interact with other GSNs, in other backbone network domains, and other ISNs and TSNs within its own backbone network domain.

**3.4 interface serving node (ISN):** A functional entity which provides the interface with SCNs. This functional entity contains the call service nodal function, and one or more bearer interworking functions which interact with the SCN and its peers within the backbone network.

**3.5 serving node (SN):** A functional entity that is either an ISN, a GSN or a TSN.

**3.6 switched circuit network (SCN):** Generic term for any network that uses circuit switching technology, i.e., ISDN, PSTN, PLMN, etc.

**3.7 transit serving node (TSN):** A functional entity which provides transit functionality between two SNs. This functional entity contains the call service transit function, and supports one or more bearer interworking functions. TSNs interact with other TSNs, GSNs and ISNs within their own backbone network domain.

## 4 Abbreviations

This Recommendation uses the following abbreviations:

AAL	Asynchronous Transfer Mode Adaptation Layer
AE	Application Entity
AEI	Application Entity Invocation
AP	Application Process
APM	Application Transport Mechanism
APM-user	Application Transport Mechanism User Application
APP	Application Transport Parameter
ASE	Application Service Element
ATII	Application Transport Instruction Indicator
BAT	Bearer Association Transport
BICC	Bearer Independent Call Control
CMN	Call Mediation Node
DTMF	Dual Tone Multi-Frequency
EH	Errors Handling
GSN	Gateway Serving Node
IAM	Initial Address Message
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISN	Interface Serving Node
ISUP	ISDN User Part
LE	Local Exchange
LSB	Least Significant Bit



M/O	Mandatory/Optional
MACF	Multiple Association Control Function
MSB	Most Significant Bit
NI	Network Interface
NNI	Network Node Interface
PAN	Public Addressed Node
PIN	Public Initiating Node
RTP	Real time Transport Protocol
SACF	Single Association Control Function
SAO	Single Association Object
SCN	Switched Circuit Network
SN	Serving Node
TE	Transit Exchange
TSN	Transit Serving Node

## 5 Conventions

For the purpose of this Recommendation, the following conventions apply:

- 1) The name of each element of the following classes of terms is capitalized:
  - indicators;
  - parameters;
  - identifiers;
  - information elements;
  - methods/functions.

Example: Backbone Network Connection Identifier information element.

- 2) For the name and the type of a service primitive, the following applies:
  - the name is capitalized;
  - the type is separated from the name by "."

Example: BICC\_Data.request primitive.

- 3) The definition of a parameter value is written in *italics* and is put between quotation marks.  
Example: "*BAT ASE*".

## 6 Recommendation structure

The description of the BICC procedures in this Recommendation is structured according to the model described in 7.2. The description is thus divided into two main parts:

- Protocol functions.
- Non-protocol functions, i.e., exchange nodal functions; this is referred to as the "Application Process".

This Recommendation describes only the part of the total Application Process and Protocol functions in the exchange that relates to NNI enhancements for the support of the transport of bearer-related information for BICC.

The signalling association is subdivided into three parts: Bearer Association Transport (BAT ASE), Application Transport Mechanism (APM ASE) and BICC ASE. These are coordinated by the Single Association Control Function (SACF).

The Application Process (AP) contains all Call Control functions; however, this Recommendation will only describe the enhancements required to support the Bearer Independent Call Control. The Application Process relevant BICC functionality can be found in [3].

The service primitive technique, used to define the ASEs and the SACF specific to the application's signalling needs is a way of describing how the services offered by an ASE, or SACF, the provider of (a set) of service(s), can be accessed by the user of the service(s), the SACF or the Application Process (AP), respectively.

The service primitive interface is a conceptual interface and is not a testable or accessible interface. It is a descriptive tool. The use of service primitives at an interface does not imply any particular implementation of that interface, nor does it imply that an implementation must conform to that particular service primitive interface to provide the stated service. All conformance to the BICC specifications is based on the external behaviour at a node, i.e., on the generation of the correct message structure (as specified in [1] and [3])/operation structure (as specified in this Recommendation) and in the proper sequence (as specified in [3] and in this Recommendation).

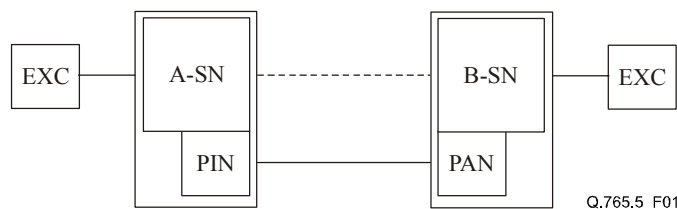
The structure and examples of its usage are illustrated in 7.2.

The relationship between the existing ISDN network functionality and the Application Transport Mechanism service provided by the public NNI (BICC) is described as a network model in 7.1.

## 7 Modelling

The models described in this clause introduce concepts and terminology used in this specification of the BICC use of the capability of the Application Transport Mechanism (APM).

### 7.1 Network model



**Figure 1/Q.765.5 – BICC network topology**

This clause provides an illustration of the use of the APM in the support of BICC. The APM provides the means to transport BICC specific information needed for the establishment of bearer connections across a core bearer network and the binding between the call control instance and the bearer control instance(s).

Figure 1 shows an example of a network topology for the BICC (additional configurations are possible that include CMNs). A-SN is the incoming SN and B-SN is the outgoing SN. The SN exchanges are connected to other network exchanges (EXC) which may be ISDN exchanges within the existing narrow-band PSTN network with an ISUP interface to the SN or other SNs with a BICC interface.

The Public Initiating Node (PIN) and Public Addressed Node (PAN) concept is introduced in [1] to assist in the description of the APM. The PIN represents the point in the network where an APM-user, in this case BICC, wishes to initiate communications towards a peer APM-user. Since

the APM implicit addressing mechanism (see [1]) is used for the BICC, the Public Addressed Node (PAN) is the next node in the call path supporting the BAT-ASE.

The call flow examples that illustrate the use of the APM may be found in ITU-T Rec. Q.1902.1 [3].

## 7.2 Specification model

### 7.2.1 Introduction

The model used to structure the description of BICC application procedures is based on the OSI Application Layer Structure (ALS) model (see [2]). This clause presents the model, gives a general description of its operation and shows the generalized model for the "Exchange Application Process" for the support of BICC. It shows how the application makes use of the Application Transport Mechanism (APM) which is described in detail in [1] and [3].

### 7.2.2 General model

The generalized model for the BICC Process is shown in Figure 2. This figure does not represent the situation at any specific point during a call but, instead, shows the full picture of the architecture. The specific application of this model is discussed below. Figure 2 shows the primitive interfaces between the functional blocks, as used in the body of this Recommendation for calls using BICC.

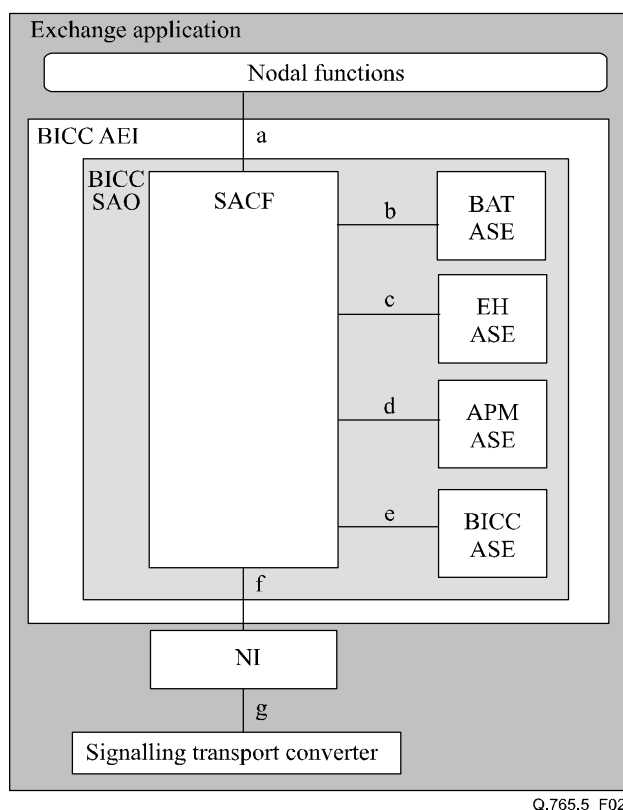


Figure 2/Q.765.5 – BICC specification model

With respect to Figure 2, all functions also have an interface to a "Maintenance application"; this is not defined as a formal primitive interface.

The term "Exchange Application Process" is used to describe all the Application functionality in an exchange. BICC is a part of the Exchange Application Process. Thus the BICC Nodal functions

shown on the model are referred to as the BICC Application Process functions in the body of this Recommendation.

The APM ASE, and EH ASE are described in detail in [1] and [3].

The BICC AEI and BICC ASE are similar to the ISUP AEI and ISUP ASE. The ISUP AEI and ISUP ASE are described in detail in [1].

NOTE – Further clarifications about the BICC protocol modelling and relationships between BICC AEI, BICC ASE and ISUP AEI, ISUP ASE are given in [3].

The BAT ASE is a user of the services offered by the APM ASE. It is responsible for preparing the bearer-related information in a form that can be transported by the public Application Transport Mechanism (APM).

The SACF has the responsibility of coordinating the flow of primitives between its interfaces in the appropriate manner.

To handle any particular BICC function, the Exchange Application Process creates an instance of the required BICC Nodal functions. The AP will create instances, as required, of the BICC AEI. The Network Interface (NI) function exists to distribute messages received via the Signalling Transport Converter to the appropriate instance of the BICC AEI. There is only one instance of the NI in an exchange. The NI is described in detail in [1] and [3].

The SAO contained in the BICC AE is one of the following types:

a) *Public Initiating Node*

This contains:

- Outgoing BICC ASE, Initiating APM ASE, Initiating EH ASE, Outgoing BAT ASE and BICC SACF.

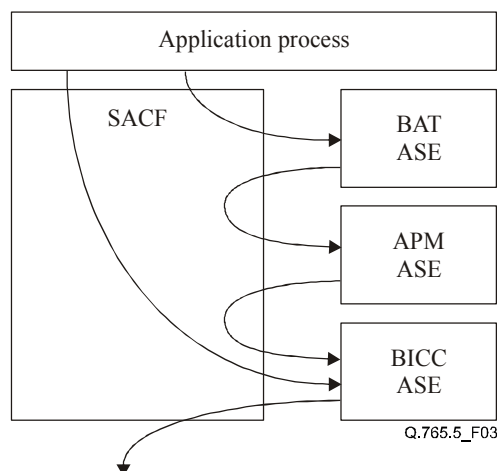
b) *Public Addressed Node*

This contains:

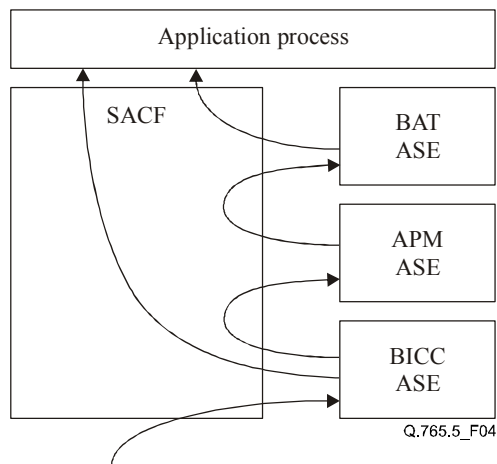
- Incoming BICC ASE, Addressed APM ASE, Addressed EH ASE, Incoming BAT ASE and BICC SACF.

### 7.2.3 Signalling Flows

Figures 3 and 4 illustrate the dynamic primitive flows for a BICC call over the BICC for the case that a call control message is coincident with the application information flow. Figure 3 shows the case when a message is being sent, Figure 4 shows the case when a message is being received.

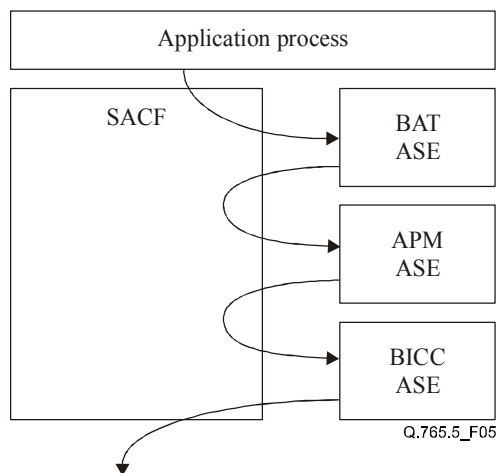


**Figure 3/Q.765.5 – Dynamic primitive flows for coincident call control messages: message sent**

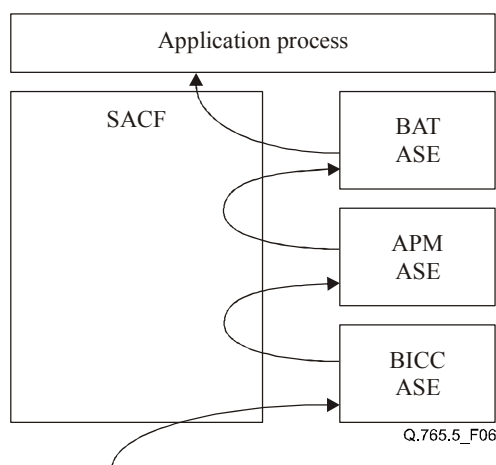


**Figure 4/Q.765.5 – Dynamic primitive flows for coincident call control messages: message received**

Figures 5 and 6 illustrate the dynamic primitive flows for the BICC support where no call control messages are sent coincidentally. That is, the APM ASE initiates a primitive towards the BICC ASE which in turn sends an APM message which will provide a mechanism for supporting the information flows.



**Figure 5/Q.765.5 – Dynamic primitive flows with no coincident call control messages: message sent**



**Figure 6/Q.765.5 – Dynamic primitive flows with no coincident call control messages: message received**

## 8 BICC application process functions

### 8.1 Introduction

The modelling of the Application Process (AP) is outside the scope of this Recommendation. However, in order to appreciate the role of the AP for the purposes of this Recommendation, this clause describes the service primitive interface between the AP and the BICC SACF.

NOTE – This Recommendation specifies the APM-user to support the transport of the bearer-related information for the BICC. The Application Process functions relating to the handling of the bearer are outside the scope of this Recommendation. These AP-functions are specified in [3] and the relevant bearer specific Supplement (ITU-T Supplement 23 to Q-series Recommendations).

### 8.2 Primitive interface (AP-BICC SACF)

The primitive interface (interface a in Figure 2) between the AP and the BICC SACF consists of primitives required to support the public network basic call functionality, and those to support the BICC functionality. The primitives related to the public network functionality are outside the scope of this Recommendation, although references are made to them through functional inferences within the text. The public basic call (see [3]) is not described using ALS concepts, hence the need for functional inferences to the public basic call functionality rather than specific references to primitives. The primitives related to the BICC functionality providing the interface between this Recommendation and ITU-T Rec. Q.1902.1 [3] are described in this Recommendation, see Table 1 and 8.3.

**Table 1/Q.765.5 – Primitives between AP and BICC SACF**

Primitive name	Types	Direction (Note)
BICC_Data	Indication/Request	→/←
BICC_Error	Indication	→
NOTE – Primitive flow from SACF to AP: → Primitive flow from AP to SACF: ←		

### 8.3 Primitive contents

Tables 2 and 3 contain the list of parameters in the primitives of Table 1.

Mandatory/Optional (M/O) indications are provided as well as a reference for a detailed description of the parameters.

**Table 2/Q.765.5 – Contents of the BICC\_Data Ind/Req primitive**

Parameter	Mandatory/Optional	Reference
ATII	M	See [3]
Action Indicator	O	See 11.1
Backbone Network Connection Identifier	O	See 11.1
Interworking Function Address	O	See 11.1
Codec List	O	See 11.1
Single Codec	O	See 11.1
BAT Compatibility Report	O	See 11.1
Bearer Network Connection Characteristics	O	See 11.1
Bearer Control Information	O	See 11.1
Bearer Control Tunnelling	O	See 11.1
Bearer Control Unit Identifier	O	See 11.1
Signal	O	See 11.1
Bearer Redirection Capability	O	See 11.1
Bearer Redirection Indicators	O	See 11.1
Signal Type	O	See 11.1
Duration	O	See 11.1
NOTE – Each parameter (except ATII) is accompanied by compatibility information, see [3] and 11.1.		

**Table 3/Q.765.5 – Contents of the BICC\_Error Ind primitive**

Parameter	Mandatory/Optional	Reference
Error Notification	M	See 10.2.1.2 and 10.2.1.3

## 9 Single Association Control Function (SACF) – BICC SACF

### 9.1 Introduction

The main objective of BICC SACF is to receive/deliver primitives from/to the appropriate entity and to perform a distribution function where appropriate for the BICC AEI. The flow of information is from the AP (interface a in Figure 2) towards NI (interface f in Figure 2) or vice versa, therefore, the SACF is also responsible for ensuring that when multiple primitives are generated by the ASEs towards the AP, they are delivered across the interface together to ensure that the correct associations are maintained. The SACF described here only defines the mapping and functions related to the BICC support of BICC aspects of the model. The SACF functionality related to the public APM functionality is outside the scope of this Recommendation. The mapping of primitives in Tables 4 and 7 are in [1] and are included here for informative purposes only.

## 9.2 Information flows related to messages sent by the node

On receipt of a primitive (request or response) from the Application Process (AP) (interface a in Figure 2), the SACF issues appropriate primitive(s) to the ASEs, populating the parameters in the generated primitives from the appropriate subset of the parameters received from the AP. The SACF also performs distribution of the responding primitives received from the ASEs prior to sending the resulting primitive to NI (interface f in Figure 2).

**Table 4/Q.765.5 – Mapping between BAT ASE and APM ASE primitives**

Interface b, from BAT ASE	Interface d, APM ASE
APM_U_Data	APM_Data

**Table 5/Q.765.5 – Mapping between AP and BAT ASE primitives**

Interface a, from AP	Interface b, BAT ASE
BICC_Data	BICC_Data

## 9.3 Information flows related to messages received by the node

These procedures are described in [1] where the APM-user ASE corresponds with the BAT ASE.

**Table 6/Q.765.5 – Mapping between BAT ASE and AP primitive**

Interface b, BAT ASE	Interface a, from AP
BICC_Data	BICC_Data
BICC_Error	BICC_Error

**Table 7/Q.765.5 – Mapping between APM ASE and BAT ASE primitives**

Interface d, from APM ASE	Interface b, BAT ASE
APM_Data	APM_U_Data

**Table 8/Q.765.5 – Mapping between EH ASE and BAT ASE primitives**

Interface c, from EH ASE	Interface b, BAT ASE
APM_Error	APM_U_Error

## 10 BAT ASE

The BAT ASE is responsible for preparing the information in the appropriate form that can be passed to the APM for transportation.

### 10.1 Primitive interface

Table 9 lists the primitive interface between the BAT ASE and BICC SACF (interface b in Figure 2).



**Table 9/Q.765.5 – Primitives between BICC SACF and BAT ASE**

Primitive name	Types	Direction (Note)
APM_U_Data	Indication/Request	➔/➜
APM_U_Error	Indication	➔
BICC_Error	Indication	➜
BICC_Data	Indication/Request	➜/➔
NOTE – Primitive flow from SACF to BAT ASE: ➔ Primitive flow from BAT ASE to SACF: ➜		

## 10.2 Signalling procedures

### 10.2.1 Public initiating node

#### 10.2.1.1 Sending procedures

On reception of the BICC\_Data.request primitive, its contents are prepared in the appropriate format and the Context identifier value is set to "*BAT ASE*". The result is sent in the APM\_U\_Data.request primitive.

#### 10.2.1.2 Receiving procedures

On reception of the APM\_U\_Data.indication primitive, its contents are checked for correct format and coding.

If an information element passes this check, it is added to the BICC\_Data.indication primitive.

If an information element fails this check, the information element and the related problem report (indicating "*unrecognized information*") is added to the BICC\_Error.indication primitive.

NOTE – If the top level information element is of "constructor" type, then it is handled as a single entity.

Once all information elements have been analysed, the BICC\_Data.indication primitive and/or the BICC\_Error.indication primitive shall be sent.

#### 10.2.1.3 APM\_U\_Error primitive

On reception of the APM\_U\_Error.indication primitive, the contents should be passed unchanged in the BICC\_Error primitive.

### 10.2.2 Public addressed node

See 10.2.1.

### 10.2.3 Signalling congestion

In order to avoid congestion in the signalling network, it is necessary that applications that contribute signalling load towards a congested destination limit their signalling traffic in a controlled manner. The congestion control procedures are outside the scope of this Recommendation. Refer to [3].

## 10.3 Primitive contents

Tables 10 and 11 list the mandatory and optional contents for the BAT ASE service primitives. These primitives are defined in [1] and are included here for informative purposes only.

The contents of the BICC\_Error and BICC\_Data primitives defined at the AP/SACF interface (Table 1) are described in 8.3.

Mandatory/Optional (M/O) indications are provided.

NOTE – In the context of BAT, implicit addressing is used, see [1] and [3].

**Table 10/Q.765.5 – Contents of the APM\_U\_Data Ind/Req primitive**

Parameter	Mandatory/Optional
Application Context Identifier	M
Application Transport Instruction Indicators	M
Application Data	M

**Table 11/Q.765.5 – Contents of the APM\_U\_Error Ind primitive**

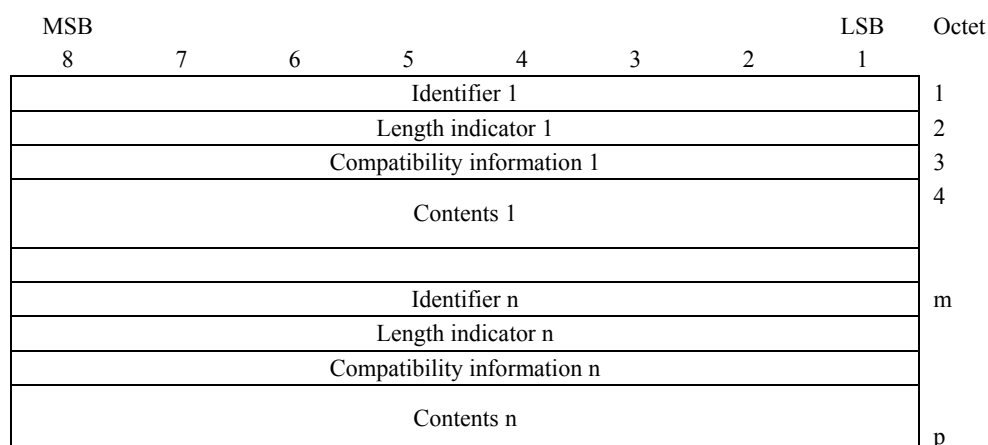
Parameter	Mandatory/Optional
Notification	M

## 11 BICC Transport – Formats and codes of application data

### 11.1 Encapsulated application information

#### 11.1.1 General layout

The general layout of the Encapsulated Application Information field of the Application Transport parameter (see [1] and [3]) is shown in Figure 7.



**Figure 7/Q.765.5 – Encapsulated application information field**

Each information element within the Encapsulated Application Information field has the same structure. An information element consists of four fields which always appear in the following order: Identifier (one octet), Length indicator, Compatibility information, Contents.

The Identifier distinguishes one type from another one and governs the interpretation of the contents. There are two types of Identifiers: type "constructor", and type "simple". In case of "constructor", the Contents field shall again consist of one or more information elements, each of which is structured as described above, i.e., Identifier, Length indicator, Compatibility information, Contents. In case of "simple", the Contents field contains one value only.

When passing on an information element of type "constructor", the order of the information elements within this "constructor" shall be maintained.

The Length indicator specifies the length (i.e., integral number of octets in pure binary representation) of the Compatibility information and Contents. The length does not include the Identifier, nor the Length indicator. The format of the Length indicator is shown in Figure 8. Bit 8 is defined as Extension indicator and indicates whether or not the information on the length continues

through the next octet. Value "0" of the Extension indicator means "*information continues through the next octet*", while value "1" means "*last octet*". The Length indicator itself has a maximum length of 2 octets, i.e., if octet 1a is needed, the Extension indicator of octet 1a is always set to value "1".

8	7	6	5	4	3	2	1	Octet
ext.							LSB	1
ext. 1	0	0	0	MSB				1a

**Figure 8/Q.765.5 – Length indicator**

The Compatibility information contains corresponding instructions for the case that the received information element is unrecognized. The format of this field is shown in Figure 9.

8	7	6	5	4	3	2	1	Octet
ext.	pass-on not possible			reserved	general action			1
	send notification indicator	instruction indicator			send notification indicator	instruction indicator		

**Figure 9/Q.765.5 – Compatibility information**

The following codes are used in the subfields of the Compatibility information field.

- a) Bits
  - 2 1 *Instruction indicator for general action*
  - 0 0 Pass on information element
  - 0 1 Discard information element
  - 1 0 Discard BICC data
  - 1 1 Release call
- b) Bit
  - 3 *Send notification indicator for general action*
  - 0 Do not send notification
  - 1 Send notification
- c) Bit
  - 4 reserved
- d) Bits
  - 6 5 *Instruction indicator for pass-on not possible*
  - 0 0 Release call
  - 0 1 Discard information element
  - 1 0 Discard BICC data
  - 1 1 reserved (interpreted as 00)

- e) Bit  
7 *Send notification indicator for pass-on not possible*  
0 Do not send notification  
1 Send notification
- f) Bit  
8 *Extension indicator*  
0 Information continues through the next octet  
1 Last octet

The Contents field is the substance of the element and contains the information the element is intended to convey.

### 11.1.2 List of identifiers

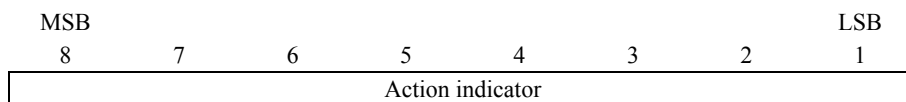
Table 12 contains the list of Identifiers.

**Table 12/Q.765.5 – List of identifiers**

Value	Information element name	Type	Reference
0000 0000	Spare	–	–
0000 0001	Action Indicator	simple	11.1.3
0000 0010	Backbone Network Connection Identifier	simple	11.1.4
0000 0011	Interworking Function Address	simple	11.1.5
0000 0100	Codec List	constructor	11.1.6
0000 0101	Single Codec	simple	11.1.7
0000 0110	BAT Compatibility Report	simple	11.1.8
0000 0111	Bearer Network Connection Characteristics	simple	11.1.9
0000 1000	Bearer Control Information	simple	11.1.10
0000 1001	Bearer Control Tunnelling	simple	11.1.11
0000 1010	Bearer Control Unit Identifier	simple	11.1.12
0000 1011	Signal	constructor	11.1.13
0000 1100	Bearer Redirection Capability	simple	11.1.14
0000 1101	Bearer Redirection Indicators	simple	11.1.15
0000 1110	Signal Type	simple	11.1.16
0000 1111	Duration	simple	11.1.17
0001 0000 to 1101 1111	Spare	–	–
1110 0000 to 1111 1111	reserved for national use	–	–
NOTE – The use and the meaning of these information elements are bearer specific and are specified in ITU-T Supplement 23 to Q-series Recommendations.			

### 11.1.3 Action indicator

The format of the Action Indicator is shown in Figure 10.



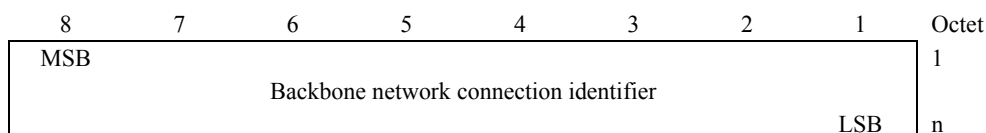
**Figure 10/Q.765.5 – Action indicator**

The following codes are used in the Action Indicator field:

0000 0000	no indication
0000 0001	connect backward
0000 0010	connect forward
0000 0011	connect forward, no notification
0000 0100	connect forward, plus notification
0000 0101	connect forward, no notification + selected codec
0000 0110	connect forward, plus notification + selected codec
0000 0111	use idle
0000 1000	connected
0000 1001	switched
0000 1010	selected codec
0000 1011	modify codec
0000 1100	successful codec modification
0000 1101	codec modification failure
0000 1110	mid-call codec negotiation
0000 1111	modify to selected codec information
0001 0000	mid-call codec negotiation failure
0001 0001	start signal, notify
0001 0010	start signal, no notify
0001 0011	stop signal, notify
0001 0100	stop signal, no notify
0001 0101	start signal acknowledge
0001 0110	start signal reject
0001 0111	stop signal acknowledge
0001 1000	bearer redirect
0001 1001	} spare
to	
1101 1111	
1110 0000	} reserved for national use
to	
1111 1111	

### 11.1.4 Backbone network connection identifier

The format of the Backbone Network Connection Identifier is shown in Figure 11.

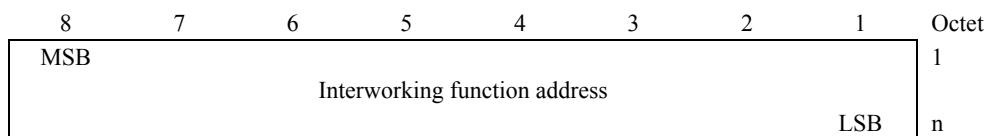


**Figure 11/Q.765.5 – Backbone network connection identifier**

The contents of the Backbone Network Connection Identifier is bearer specific and is specified in the relevant Supplement 23 to Q-series Recommendations. The maximum length of this field is 4 octets.

### 11.1.5 Interworking function address

The format of the Interworking Function Address is shown in Figure 12.



**Figure 12/Q.765.5 – Interworking function address**

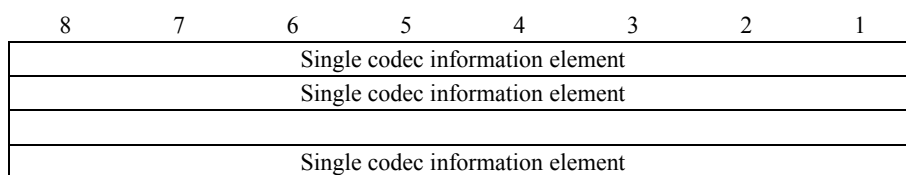
The Interworking Function Address is in NSAP format according to Annex A/X.213 | ISO/IEC 8348 and its Amendment 1 [4].

NOTE – Other formats may be defined in bearer specific documents in future.

### 11.1.6 Codec list

#### 11.1.6.1 Format

The format of the Codec List is shown in Figure 13.



**Figure 13/Q.765.5 – Codec list**

The Single Codec information element is specified in 11.1.7.

#### 11.1.6.2 List of codecs

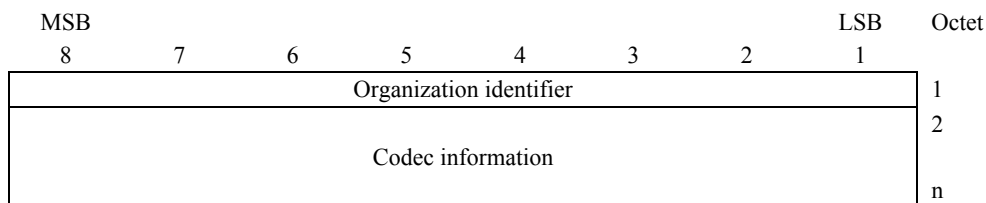
Figure 13 shows the layout of the Codec List for codec negotiation. The Single Codec information elements are listed in decreasing order of preference level. The first Single Codec information element has the highest preference level, and the last Single Codec information element is the one with the lowest preference level.

#### 11.1.7 Single codec

The Single Codec information element for a specific codec is coded as a variable length field with the following subfields:

- OID – Organization identifier subfield – (1 octet): Identifies standardization/private organizations;
- Codec Information subfield.

Figure 14 illustrates the layout of the Single Codec information element.



**Figure 14/Q.765.5 – Single codec**

### 11.1.7.1 Organization identifier subfield

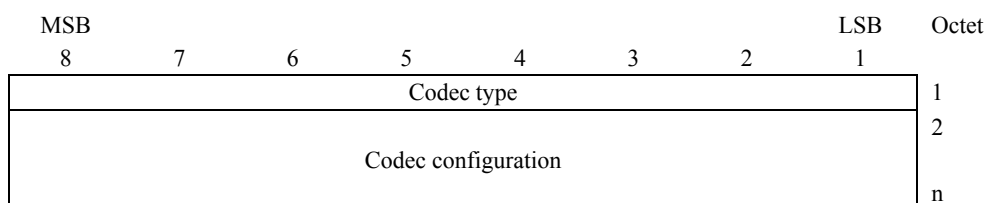
The following codes are used for the Organization Identifier subfield:

0000 0000	no indication
0000 0001	ITU-T
0000 0010	ETSI (refer to TS 26.103)
0000 0011	} reserved for use by IMT-2000 family members
to	
0010 0001	
0010 0010	} spare
to	
1101 1111	
1110 0000	} reserved for national use
to	
1111 1111	

### 11.1.7.2 Codec information subfield

#### 11.1.7.2.1 ITU-T

The format of the Codec Information subfield in case of Organization ID = ITU-T is shown in Figure 15.



**Figure 15/Q.765.5 – Codec information subfield**

### 11.1.7.2.1.1 Codec Type subfield

The following codes are used for the Codec Type subfield:

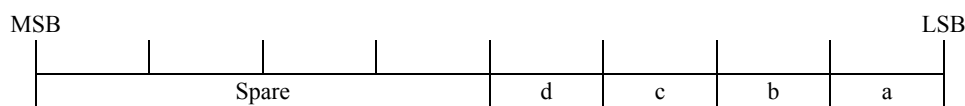
0000 0000	no indication
0000 0001	G.711 64 kbit/s A-law
0000 0010	G.711 64 kbit/s $\mu$ -law
0000 0011	G.711 56 kbit/s A-law
0000 0100	G.711 56 kbit/s $\mu$ -law
0000 0101	G.722 (SB-ADPCM)
0000 0110	G.723.1
0000 0111	Annex A/G.723.1 (silence suppression)
0000 1000	G.726 (ADPCM)
0000 1001	G.727 (Embedded ADPCM)
0000 1010	G.728
0000 1011	G.729 (CS-ACELP)
0000 1100	Annex B/G.729 (silence suppression)
0000 1101	} spare
to	
1111 1111	

### 11.1.7.2.1.2 Codec Configuration subfield

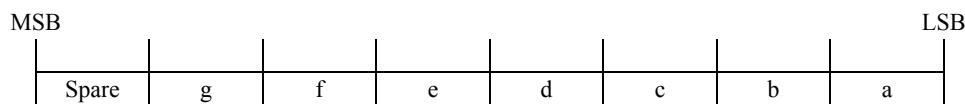
There are no configuration data in the case of ITU-T codec types G.711, G.722 and G.723.1.

ITU-T codecs G.726, G.727, G.728 and G.729 (with and without silence suppression) may operate at different bit rates. Common implementations of these codecs can operate in all the modes (bit rates) and switch from one mode to another upon command in a per frame basis (through in-band signalling). Therefore, the configuration field is optional for all aforementioned codec types. The configuration field is present when it is required to signal that only one or several modes of operation out of the full set are supported. The configuration field is not present if all the modes of operation of the codec are supported (the general case).

Figure 16 and Table 13 show the configuration data coding for each of the aforementioned codecs.



a) G.726 and G.727 codec types



b) G.728, G.729 and Annex B/G.729 codec types

**Figure 16/Q.765.5 – Coding for the 1 octet long configuration field**



**Table 13/Q.765.5 – Coding of configuration fields**

Codec Type	Configuration Data							
	g	f	e	d	c	b	a	
0000 1000 G.726				x	x	x	1	16 kbit/s supported
				x	x	x	0	16 kbit/s not supported
				x	x	1	x	24 kbit/s supported
				x	x	0	x	24 kbit/s not supported
				x	1	x	x	32 kbit/s supported
				x	0	x	x	32 kbit/s not supported
				1	x	x	x	40 kbit/s supported
				0	x	x	x	40 kbit/s not supported
0000 1001 G.727				x	x	x	1	16 kbit/s supported
				x	x	x	0	16 kbit/s not supported
				x	x	1	x	24 kbit/s supported
				x	x	0	x	24 kbit/s not supported
				x	1	x	x	32 kbit/s supported
				x	0	x	x	32 kbit/s not supported
				1	x	x	x	40 kbit/s supported
				0	x	x	x	40 kbit/s not supported
0000 1010 G.728	x	x	x	x	x	x	1	9.6 kbit/s supported
	x	x	x	x	x	x	0	9.6 kbit/s not supported
	x	x	x	x	x	1	x	12.8 kbit/s supported
	x	x	x	x	x	0	x	12.8 kbit/s not supported
	x	x	x	x	1	x	x	16 kbit/s supported
	x	x	x	x	0	x	x	16 kbit/s not supported
0000 1011 G.729	x	x	x	x	x	x	1	6.4 kbit/s supported
	x	x	x	x	x	x	0	6.4 kbit/s not supported
	x	x	x	x	x	1	x	8 kbit/s supported
	x	x	x	x	x	0	x	8 kbit/s not supported
	x	x	x	x	1	x	x	11.8 kbit/s supported
	x	x	x	x	0	x	x	11.8 kbit/s not supported
	x	x	x	1	x	x	x	Annex A supported
	x	x	x	0	x	x	x	Annex A not supported
	x	x	1	x	x	x	x	Annex H supported
	x	x	0	x	x	x	x	Annex H not supported
	x	1	x	x	x	x	x	Annex F supported
	x	0	x	x	x	x	x	Annex F not supported
	1	x	x	x	x	x	x	Annex G supported
	0	x	x	x	x	x	x	Annex G not supported

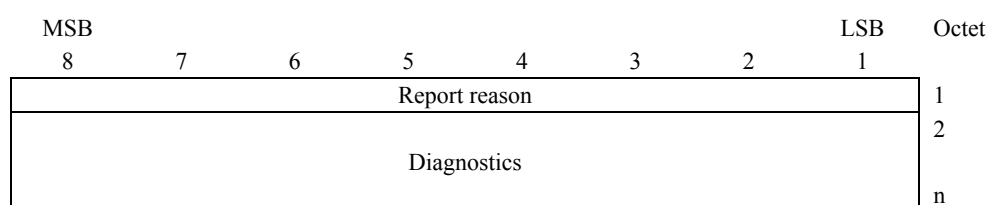
**Table 13/Q.765.5 – Coding of configuration fields**

Codec Type	Configuration Data							
	g	f	e	d	c	b	a	
0000 1100 Annex B/G.729	x	x	x	x	x	x	1	6.4 kbit/s supported
	x	x	x	x	x	x	0	6.4 kbit/s not supported
	x	x	x	x	x	1	x	8 kbit/s supported
	x	x	x	x	x	0	x	8 kbit/s not supported
	x	x	x	x	1	x	x	11.8 kbit/s supported
	x	x	x	x	0	x	x	11.8 kbit/s not supported
	x	x	x	1	x	x	x	Annex A supported
	x	x	x	0	x	x	x	Annex A not supported
	x	x	1	x	x	x	x	Annex H supported
	x	x	0	x	x	x	x	Annex H not supported
	x	1	x	x	x	x	x	Annex F supported
	x	0	x	x	x	x	x	Annex F not supported
	1	x	x	x	x	x	x	Annex G supported
0	x	x	x	x	x	x	Annex G not supported	

Each one of the a, b, c, d, e, f and g bits corresponds to one mode of operation (bit rate) for the codec. A value of "1" means that the mode is supported, a value of "0" that the mode is not supported and a value of "x" stands for "irrelevant".

### 11.1.8 BAT compatibility report

The format of the BAT Compatibility Report is shown in Figure 17.



**Figure 17/Q.765.5 – BAT compatibility report**

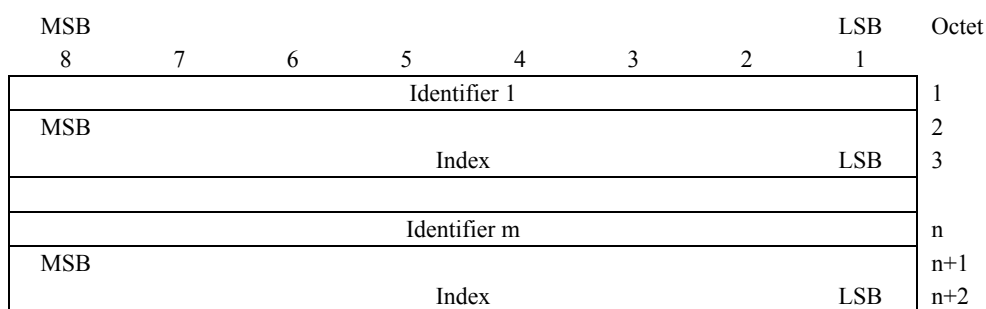
a) *Report Reason*

The following report reasons are defined:

- 0000 0000 no indication
- 0000 0001 information element non-existent or not implemented
- 0000 0010 BICC data with unrecognized information element, discarded
- 0000 0011 } spare
- to
- 1101 1111 }
- 1110 0000 } reserved for national use
- to
- 1111 1111 }

b) *Diagnostics*

Figure 18 shows the format of the diagnostics.



**Figure 18/Q.765.5 – Diagnostics**

The field "Identifier n" contains the Identifier value of the nth upgraded information element in accordance with Table 12. The field "Index" has a fixed length of 2 octets and is a pointer (integral number of octets in pure binary representation) either to the Identifier value of the information element concerned or to an information element identifier octet within the information element concerned.

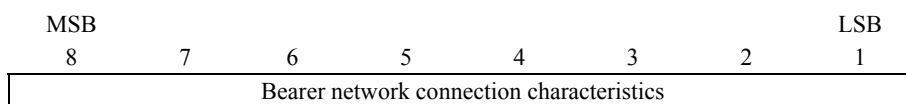
If an unrecognized Identifier value x is received, "Identifier n" contains this Identifier value x, and the value of "Index" is "0".

If an information element x of type "simple" is received which is recognized but its contents are unrecognized, the "Identifier n" contains the Identifier value of this information element x, and the value of "Index" is "0".

If an information element x of type "constructor" is received which is recognized but its contents are unrecognized (i.e., either unrecognized Identifier value or unrecognized contents of a recognized information element), the "Identifier n" contains the Identifier value of this information element x, and the value of "Index" is a pointer to the Identifier value octet of the information element which is unrecognized or whose contents are unrecognized. The value of "Index" is "1" plus the number of octets between the Constructor information element identifier octet and the unrecognized information element identifier octet, not including either information element identifier octet.

**11.1.9 Bearer network connection characteristics**

The format of the Bearer Network Connection Characteristics is shown in Figure 19.



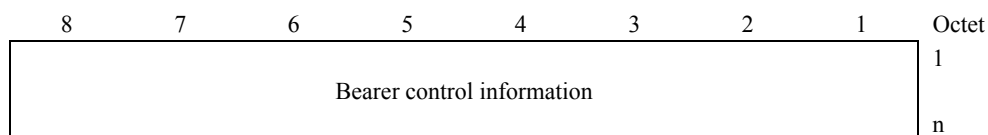
**Figure 19/Q.765.5 – Bearer network connection characteristics**

The following codes are used in the Bearer Network Connection Characteristics:

0000 0000	no indication
0000 0001	AAL type 1
0000 0010	AAL type 2
0000 0011	Structured AAL type 1
0000 0100	IP/RTP
0000 0101	TDM (reserved for use by ITU-T Rec. Q.1950)
0000 0110	} spare
to	
1101 1111	
1110 0000	} reserved for national use
to	
1111 1111	

### 11.1.10 Bearer control information

The format of the Bearer Control Information is shown in Figure 20.

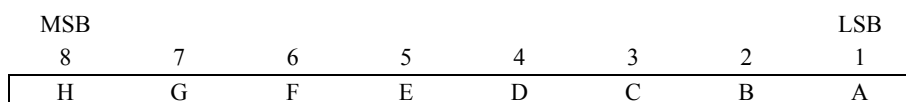


**Figure 20/Q.765.5 – Bearer control information**

The Bearer Control Information information element contains the bearer control tunnelling protocol data unit; see [5].

### 11.1.11 Bearer control tunnelling

The format of the Bearer Control Tunnelling is shown in Figure 21.



**Figure 21/Q.765.5 – Bearer control tunnelling**

Bits

*A* Bearer Control Tunnelling indicator

0 no indication

1 tunnelling to be used

*H-B* spare

The Bearer Control Tunnelling indicator (bit A) signals that bearer control tunnelling is to be used.

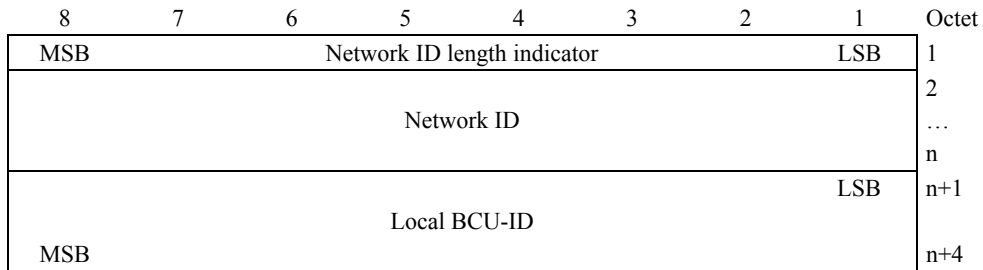
### 11.1.12 Bearer control unit identifier

The Bearer Control Unit Identifier information element contains information sent in the forward and backward directions to aid Bearer Interworking Function selection by the Call Service Function. A Bearer Interworking Function may consist of one or more Bearer Control Units (BCUs) where a BCU represents a physical grouping.

The definition of the Network ID subfield is the same as for the Network ID of the Global Call Reference parameter (see [7]).

The Local BCU-ID subfield is an identifier that uniquely identifies a BCU entity within a network domain.

The format of the Bearer Control Unit Identifier is shown in Figure 22.



**Figure 22/Q.765.5 – Bearer control unit identifier**

The following codes are used in the Bearer Control Unit Identifier:

1) *Network ID Length indicator*

The Network ID Length indicator specifies the length (i.e., integral number of octets in pure binary representation) of the Network ID subfield. The length does not include the Network ID Length indicator.

2) *Network ID*

The coding of the Network ID field is identical to the coding of the Network ID field in the Global Call Reference parameter as specified in clause 6/Q.1902.3 (see [7]).

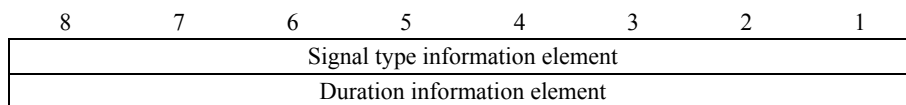
NOTE – When used inside a network domain, the Network ID may be omitted by setting the Network ID Length indicator to the value "0".

3) *Local BCU-ID*

A binary number that uniquely identifies the BCU within a network domain.

**11.1.13 Signal**

The format of the Signal is shown in Figure 23.



**Figure 23/Q.765.5 – Signal**

The Signal Type information element is specified in 11.1.16, and the Duration information element is specified in 11.1.17.

The Signal information element containing the Signal Type information element is mandatory if, and only if, the Action indicator is set to the value "start signal, notify" or "start signal, no notify". The purpose of the Signal Type information element is to convey a value for a single signal. Optionally, the duration of the signal may be specified in the Duration information element, i.e., the Signal information element may contain the Signal Type information element only.

The duration of the signal can be controlled:

- either implicitly by a sequence of messages with the Action indicator set to "start signal, notify"/"start signal, no notify" and "stop signal, notify"/"stop signal, no notify"; or
- implicitly by the signal itself; or
- explicitly by a message with the Action indicator set to "start signal, notify"/"start signal, no notify" accompanied by a Signal information element containing the Signal Type information element and the Duration information element indicating the duration. In this case, no Action indicator with "stop signal, notify"/"stop signal, no notify" is sent by the originator. If a notification has been requested in the Action indicator, an Action indicator set to "start signal acknowledge" or "start signal reject" is sent back, i.e., there is no additional notification for the end of the signal.

#### 11.1.14 Bearer redirection capability

The Bearer Redirection Capability information element contains information sent in the forward direction at call setup to indicate that the sending node supports Bearer Redirection, and to indicate support of options within the capability.

The format of the Bearer Redirection Capability is shown in Figure 24.

MSB							LSB
8	7	6	5	4	3	2	1
ext.	G	F	E	D	C	B	A

**Figure 24/Q.765.5 – Bearer redirection capability**

Bits

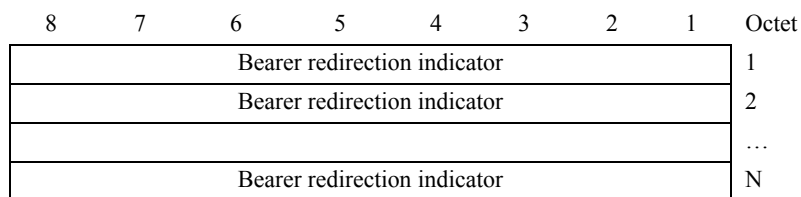
- A*     *Late Cut-through capability indicator*  
0     Late Cut-through not supported  
1     Late Cut-through supported
- B*     *Conference capability indicator*  
0     Conference not supported  
1     Conference supported
- C*     *Automatic cut-through capability indicator*  
0     Automatic cut-through not supported  
1     Automatic cut-through supported
- D*     *Bi-Casting capability indicator*  
0     Bi-casting not supported  
1     Bi-casting supported
- G-E*   *Spare*
- H*     *Extension indicator*  
0     Information continues through the next octet  
1     Last octet

#### 11.1.15 Bearer redirection indicators

The Bearer Redirection Indicators information element contains information sent in the forward or backward direction relating to the bearer redirection procedure.

The format of the Bearer Redirection Indicators is shown in Figure 25.

The format of the Bearer Redirection Indicators information element is not of type "constructor" but consists of a sequence of octets, each with the same format, allowing several indicator values to be included in a single information element, as follows:



**Figure 25/Q.765.5 – Bearer redirection indicators**

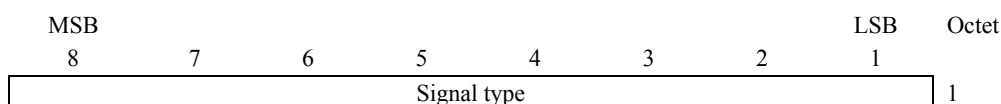
The number of the Bearer Redirection Indicator octets is derived from the length indication of the Bearer Redirection Indicators information element.

The following codes are used in the Bearer Redirection Indicator:

- 0000 0000      no indication
- 0000 0001      late cut-through request
- 0000 0010      redirect temporary reject
- 0000 0011      redirect backwards request
- 0000 0100      redirect forwards request
- 0000 0101      redirect bearer release request
- 0000 0110      redirect bearer release proceed
- 0000 0111      redirect bearer release complete
- 0000 1000      redirect cut-through request
- 0000 1001      redirect bearer connected indication
- 0000 1010      redirect failure
- 0000 1011      new connection identifier
- 0000 1100      conference request
- 0000 1101      conference resource unavailable
- 0000 1110      bi-casting request
- 0000 1111      automatic cut-through request
- 0001 0000      } spare
- to      }
- 0111 1111      }
- 1000 0000      } reserved for national use
- to      }
- 1111 1111      }

### 11.1.16 Signal type

The format of the Signal Type is shown in Figure 26.



**Figure 26/Q.765.5 – Signal type**

The following codes are used in the Signal Type:

0000 0000	DTMF 0
0000 0001	DTMF 1
0000 0010	DTMF 2
0000 0011	DTMF 3
0000 0100	DTMF 4
0000 0101	DTMF 5
0000 0110	DTMF 6
0000 0111	DTMF 7
0000 1000	DTMF 8
0000 1001	DTMF 9
0000 1010	DTMF *
0000 1011	DTMF #
0000 1100	DTMF A
0000 1101	DTMF B
0000 1110	DTMF C
0000 1111	DTMF D
0001 0000	} spare
to	
0011 1111	
0100 0000	dial tone
0100 0001	PABX internal dial tone
0100 0010	special dial tone
0100 0011	second dial tone
0100 0100	ringing tone
0100 0101	special ringing tone
0100 0110	busy tone
0100 0111	congestion tone
0100 1000	special information tone
0100 1001	warning tone
0100 1010	intrusion tone
0100 1011	call waiting tone
0100 1100	pay tone
0100 1101	payphone recognition tone
0100 1110	comfort tone
0100 1111	tone on hold
0101 0000	record tone
0101 0001	Caller waiting tone
0101 0010	positive indication tone
0101 0011	negative indication tone
0101 0100	} spare
to	
1101 1111	
1110 0000	} reserved for national use
to	
1111 1111	

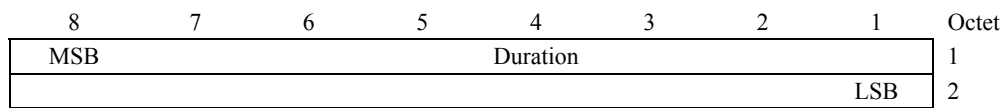
NOTE 1 – The signals 0100 0000 to 0101 0011 are defined in ITU-T Rec. E.182 [6].

NOTE 2 –The use of out-of-band transport of the value 0100 0100 "ringing tone" may cause speech clipping due to a race condition between out-of-band stop "ringing tone" and in-band speech.



### 11.1.17 Duration

The format of the Duration is shown in Figure 27.



**Figure 27/Q.765.5 – Duration**

The Duration contains the duration of the signal (see 11.1.16) in milliseconds.

### 11.2 Application context identifier

The Application Context Identifier field of the Application Transport parameter (see [3]) shall be coded "*BAT ASE*".





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