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SERIES Q: SWITCHING AND SIGNALLING

Specifications of signalling related to Bearer Independent Call Control (BICC)

Bearer independent call bearer control protocol

ITU-T Recommendation Q.1950

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ITU-T Recommendation Q.1950

Bearer independent call bearer control protocol

Summary

This Recommendation provides the procedures, commands, parameters, messages and signalling information of the Bearer Independent Call Bearer Control (CBC) protocol for the support of narrow-band ISDN services independent of the bearer technology and signalling message transport technology used.

Source

ITU-T Recommendation Q.1950 (2002) was revised by ITU-T Study Group 11 (2001-2004) and approved under the WTSA Resolution 1 procedure on 29 December 2002.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 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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Bearer independent call bearer control protocol

1 Scope

This Recommendation specifies the formats, codes and procedures of the Call Bearer Control Interface. Its scope is limited to the interface between the CSF and the BCF. The base of the Call Bearer Control protocol is H.248.1 that is tailored through the use of a BICC Capability Set and packages of the H.248.x subseries.

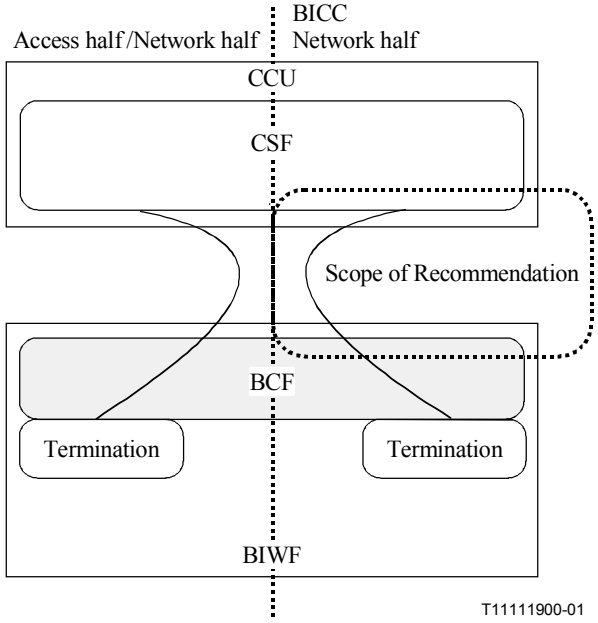

Figure 1/Q.1950 – Scope of this Recommendation

The main body of the Recommendation details the protocol for the BICC Network Half of the CBC interface. Protocols for the Access Half and Non-BICC Network Half of the interface are contained in associated annexes or separate Recommendations.

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.

2.1 Normative References

[1] ITU-T Recommendation H.248.1 (2002), *Gateway control protocol: Version 2*.

[2] ITU-T Recommendation H.248.7 (2000), *Gateway control protocol: Generic Announcement package*.

[3] ITU-T Recommendation I.230 (1988), *Definition of bearer service categories*.

[4] ITU-T Recommendation Q.765.5 (2000), *Signalling system No. 7 – Application transport mechanism: Bearer Independent Call Control (BICC).*

[5] 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*.

[6] ITU-T Recommendation Q.2150.0 (2001), *Generic Signalling Transport Service*.

[7] ITU-T Recommendation X.213 (2001), *Information technology – Open Systems Interconnection – Network service definition*.

[8] IETF RFC 2327 (1998), *SDP: Session Description Protocol*.

[9] IETF RFC 1890 (1996), *RTP Profile for Audio and Video Conferences with Minimal Control*.

2.2 Informative References

[10] ITU-T Q-series Recommendations – Supplement 32 (2002), *Technical Report TRQ.2141.1: Signalling requirements for the support of narrow-band services via broadband transport technologies – CS-2 signalling flows.*

[11] ITU-T Q-series Recommendations – Supplement 35 (2000), *Technical Report TRQ.2500: Signalling requirements for the support of the call bearer control interface (CS-1)*.

[12] ITU-T Q-series Recommendations – Supplement 7 (1999), *Technical Report TRQ.2001: General aspects for the development of unified signalling requirements*.

3 Abbreviations

This Recommendation uses the following abbreviations:

AAL ATM Adaptation Layer

AESA ATM End System Address

ATM Asynchronous Transfer Mode

BCF Bearer Control Function

BIT Bearer Information Transport

BIWF Bearer Interworking Function

BNC Backbone Network Connection

CBC Call Bearer Control

CSF Call Service Function

CSM Call State Machine

GSN Gateway Serving Node

IP Internet Protocol

ISN Interface Serving Node

MG Media Gateway

MGC Media Gateway Controller

MOD Modify

MOV Move

NOT Notify

O-BIWF Originating Bearer Interworking Function

PDU Protocol Data Unit

SUB Subtract

T-BIWF Terminating Bearer Interworking Function

TDM Time Division Multiplex

TMR Transmission Medium Requirement

USI User Service Information

4 Definitions

This Recommendation defines the following terms:

4.1 Object and call model definitions

4.1.1 Call Bearer Control (CBC): is the interface between the Call Serving Function and the Bearer Control Function.

4.1.2 connection: The connection is a logical entity representing the connection topology within a single context in the BIWF. The topology of a connection can be implied by assigning streams between terminations and/or through manipulation of the context topology.

4.1.3 context: The context is the association between one or more terminations. The BIWF creates a context and assigns a unique context identity (contextID) to it. A context cannot exist without at least one termination. When a context contains a single termination, this context may or may not contain a connection. Contexts containing a connection always will be associated with a local call instance, while a context containing no connection will not be associated with a Local Call Instance. See 6.1/H.248.1 [1].

4.1.4 end point: An end point defines the remote call or call and bearer signalling entity communicating with the CSF. This entity may be requesting actions associated with a line, trunk, or special resource function. In the object model it defines the point terminating the Call Signalling.

4.1.5 stream: A Stream specifies the parameters of a single bidirectional media stream/user data flow and is represented by a CSM assigned StreamID. See 7.1.6/H.248.1 [1].

4.1.6 stream mode: In the object model it describes the mode of the termination i.e. send, receive, send and receive. See 7.1.7/H.248.1 [1].

4.1.7 termination: A Termination is a logical entity in a BIWF that sources and/or sinks media and/or control streams. In BICC a termination sources and/or sinks a single media and/or control streams. A Termination is described by a number of characterizing Properties. Terminations have unique identities (TerminationIDs). These objects can be created "On Demand" or may be provisioned.

4.1.8 termination state: Defines the Service state of the termination e.g. In-service, Out-of-service. In the object model it describes the mode of the termination i.e. Null, Loop Back External Signal, Loop Back Internal Signal. See Termination State 7.1.5/H.248.1 [1] for the service state. For the mode of a stream i.e. loopback see 7.1.7/H.248.1 [1].

4.1.9 logical port: Defines a logical grouping of one or more media terminations and one or more signalling terminations. A Logical Port may be associated with a bearer control signalling end point.

4.1.10 Call State Machine (CSM): Defines a CSF control entity that terminates call or call and bearer peer-to-peer signalling. The prefix "O" or "T" represents the inter-relationship of CSMs

within the Local Call Instance. The "O" represents the control entity receiving an external service request, while the "T" is the control entity forwarding the request to another CSF.

4.1.11 CCU control port: Defines the signalling port associated with the CSF which is used to interact with the BIWF over the CBC Interface. This object has a unique address within the network service supplier domain.

4.1.12 BIWF control port: Defines the signalling port associated with the BIWF which is used to interact with the CCU over the CBC interface. This object has a unique address within the network service supplier domain.

4.1.13 Backbone Network Connection (BNC): Represents the edge-to-edge transport connection within the backbone network, consisting of one or more Backbone Network Connection Links (BNCL). The Backbone Network Connection represents a segment of the end-to-end Network Bearer Connection (NBC).

4.2 Call model

Refer to clause 6/H.248.1 [1].

4.3 Requests and responses

Refer to ITU-T Rec. H.248.1 [1] for descriptions of command requests and responses.

4.4 Definition of signalling flow objects

The following objects are the signalling objects to be carried by the commands in the transactions.

4.4.1 A-BNC characteristics: Are the BNC Characteristics of the BNC in the opposite half call to the current BNC.

4.4.2 announcement: Identifies that an Announcement of a certain identity be applied to a termination.

4.4.3 audit token: Specifies whether Packages and/or which type of Descriptor that are to be audited. In this Recommendation the following values are used:

– Digit Map;
– Empty (i.e. no AuditToken);
– Events;
– Media;
– MODEM;
– Mux;
– Packages;
– Signals.

4.4.4 bearer service characteristics: Identifies the user requested bearer service to be provided by the network. It is used by the BIWF to condition the bearer termination (e.g. TMR).

4.4.5 bearer information transport: Carries the tunnelled Bearer Control Information.

4.4.6 BIWF address (T-BIWF-Addr): The address on which the BNC is terminated. Passed from the terminating BIWF to the CSM and through the BICC horizontal.

4.4.7 BIWF control address: Defines the signalling address associated with the BIWF that is used to interact with the CCU over the CBC interface. This object has a unique address within the network service supplier domain.

4.4.8 BNC characteristic: Identifies the type of transport to be established across the backbone network. It is carried between call control instances via BICC signalling (e.g. IP, AAL 2).

4.4.9 BNC cut through: Indicates when the through connection of the BNC has occurred.

4.4.10 BNC-cut-through-capability: Used by the BIWF to inform the CSM of the bearer cut-through capability (i.e. commits resources on the receipt of a Bearer SetupReq or confirm).

4.4.11 BNC connected: Indicates that a termination in the BIWF has received sufficient information to determine that a bearer connection has been established.

4.4.12 BNC established: Indication that a BNC has been established on a particular termination in the BIWF.

4.4.13 BNC-ID: Identifies the logical connection between a local and remote termination.

4.4.14 BNC modified: Indicates when the characteristics (i.e. Codec, Bearer Service Characteristics) have been modified.

4.4.15 BNC release: An indication with a general reason for the disconnection or failure of a BNC (e.g. Normal Release, Interworking unspecified, etc.).

4.4.16 Cancel echo: Indicates if the echo canceller should be on or off.

4.4.17 CCU control address: Defines the signalling address associated with the CSF that is used to interact with the BIWF over the CBC interface. This object has a unique address in the network service supplier domain.

4.4.18 codec: Contains the coding information (i.e. selected CODEC) to be used by the BIWF.

4.4.19 connection configuration: Specifies the type and configuration of the connection type to be established. To specify the connection topology the connections between the terminations in a context are specified. Refer to 7.1.18/H.248.1 for more details.

4.4.20 context ID: Identifies the context entity. Generated by the BIWF upon creation of the context. In this Recommendation the following values are used: ALL, when referencing all contexts in use; Context ID, when referencing a specific context in use. Null Context, which indicates a context where terminations that have resources associated with them and are not part of a Local Call Instance reside. Refer to 8.1.2/H.248.1 for more details.

4.4.21 cut through: Indicates when through connection of BNC has occurred in either one or both directions.

4.4.22 cut through direction: Indicates in which direction the BNC should be cut through. For example Forwards, backwards, both ways.

4.4.23 detect_digit(x): Indicates that a digit stimulus is detected on a termination in a BIWF. The digit/s is indicated in "x".

4.4.24 digit: Identifies that a DTMF digit/s of a certain value (i.e. 0-9, *,#,A,B,C,D) is applied to a termination.

4.4.25 digit map descriptor: Holds Digit Map data such as Digit Map Name and Value. Refer to 7.1.14/H.248.1 for more details.

4.4.26 event: Is an indication that there has been an occurrence of the stimulus contained in a Notification Requested request. It indicates that the stimulus has been observed on a termination in a BIWF. It may contain parameters detailing the specifics of the stimulus. Refer to 7.1.9/H.248.1 for more details.

4.4.27 event descriptor: Holds Event data such as Package and Event Names and Event Parameter Names and possible Values. Refer to 7.1.9/H.248.1 for more details.

4.4.28 event ID: Provides the correlation between a request to detect an event and the notification that the event has been detected.

4.4.29 local control descriptor: Holds Local Control data such as Package and Property Names and current and possible Property Values. Refer to 7.1.7/H.248.1 for more details.

4.4.30 local descriptor: Holds Local data such as Package and Property Names and current and possible Property Values. Refer to 7.1.8/H.248.1 for more details.

4.4.31 logical port ID: Identifies the Logical Port entity. Provisioned value in BIWF (and CSF). The type of logical port is provisioned and known in the BIWF (and CSF). In the CBC protocol this Logical Port ID is represented by the Termination ID structure.

4.4.32 modem descriptor: Holds Modem data such as Package and Property Names and current and possible Property Values. Refer to 7.1.2/H.248.1 for more details.

4.4.33 mux descriptor: Holds Mux data such as Mux Type and muxed Termination Ids. Refer to 7.1.3/H.248.1 for more details.

4.4.34 non-standard data: Specifies the BIWF Type, e.g. as Brand, Version and Issue.

4.4.35 notification requested "x": Identifies to the BIWF that it must monitor a termination for the stimulus "x" to occur. Once the stimulus "x" is detected an event is sent from the BIWF to the CSM. The request for a notification may be provisioned on a termination so that whenever the termination is instantiated, so is the request for the notification of event "x". Alternatively the request may be explicit in a H.248.1 command instantiating or modifying a termination.

4.4.36 packages descriptor: Holds data about Packages such as Package Names and Versions. Refer to 7.1.16/H.248.1 for more details.

4.4.37 remote descriptor: Holds Remote data such as Package and Property Names and current and possible Property Values. Refer to 7.1.8/H.248.1 for more details.

4.4.38 service change address: Indicates the new Control Address to be used. Refer to 7.2.8/H.248.1 for more details.

4.4.39 service change delay: Specifies the delay in seconds before the service change is activated. Refer to 7.2.8/H.248.1 for more details.

4.4.40 service change method: Specifies the type of service change. Refer to 7.2.8/H.248.1 for more details. In this Recommendation the following values are used:

– Disconnected;
– Forced;
– Graceful;
– Restart;
– Handoff.

4.4.41 service change MGCID: Indicates own CCU Control Address to be used. Refer to 7.2.8/H.248.1 for more details.

4.4.42 service change reason: Specifies the reason for the service change. Refer to 7.2.8/H.248.1 for more details. In this Recommendation the following values are used:

– Cold Boot;
– Events Capability Failure;
– Loss of lower layer connectivity;
– Media Capability Failure;
– MGC Directed Change;

– Modem Capability Failure;
– Mux Capability Failure;
– Service Restored;
– Signals Capability Failure;
– Termination Taken Out Of Service;
– Transmission Failure;
– Warm Boot.

4.4.43 service change version: Indicates supported Protocol Version. Refer to 7.2.8/H.248.1 for more details.

4.4.44 service state: Specifies the overall (not stream-specific) state of a Termination/BIWF. Refer to 7.1.5/H.248.1 for more details. In this Recommendation the following values are used:
– In Service;
– Out Of Service;
– Test.

4.4.45 signal: Indicates that the stimulus specified in it is to be applied to a termination.

4.4.46 signal completion(x): Indicates that the stimulus applied to a termination has finished. "x" identifies the stimulus.

4.4.47 signal descriptor: Holds Signal data such as Package and Signal Names and Signal Parameter Names and possible Values. Refer to 7.1.11/H.248.1 for more details.

4.4.48 signal direction: Indicates the directionality of a stimulus applied to a termination. The stimulus can be placed on a termination so that none of the other terminations in the context "hear" it (external) or so that other terminations in the context "hear" it also (internal). The direction may be set to (both way) indicating that all the terminations in the context "hear" it as well as it being sent external to the BIWF.

4.4.49 signal timing: Specifies the duration, number of cycles and stop/start of a signal to be played.

4.4.50 stream mode: Specifies the type and configuration of the termination to be established. The termination can be placed in one of several connection states: Cut-through in the forward direction, backward direction, both directions, loop back towards remote termination, or idle. Refer to 7.1.7/H.248.1 for more details.

4.4.51 termination ID: Identifies the Termination entity. In this Recommendation the following values are used:
– ALL, when referencing groups or Ephemeral Terminations not in use.
– Root, when referencing the BIWF level.
– Termination(s), when in use or in a Null Context. Refer to 7.2.2/H.248.1 for more details.

4.4.52 termination state descriptor: Holds Termination State data such as Package and Property Names and current and possible Property Values. Includes also the Service State. Refer to 7.1.5/H.248.1 for more details.

4.4.53 time stamp: Allows the passing of the local time between the BIWF and the CSF at sending of commands.

4.4.54 tone: Identifies that a tone of a certain type (i.e. Alerting tone, call waiting tone) is applied to a termination.

4.4.55 transaction (ID): Commands between the CSM and the BIWF are grouped into Transactions, each of which is identified by a TransactionID. Transactions consist of one or more

Actions. An Action consists of a series of Commands that are limited to operating within a single Context. Refer to clause 8/H.248.1 for more details.

4.4.56 tunnel indication: Identifies to the BIWF that the Bearer Information Transport mechanism can be used. The CSF may request that the BIWF provide the BIT information in a Notify.ind at the same time as the Tunnel indication request. The CSF may also indicate the BIT information may be provided in a Notify.ind at a time later than the Tunnel Indication Request.

5 BICC network CBC Capability Set

5.1 Compatibility rules

ITU-T Rec. H.248.1 version 1 (2000) and H.248.1 version 2 (05/2002) are supported by this Capability Set. The compatibility rules for packages, signals, events, properties and statistics and the H.248.1 protocol are defined in clause 12/H.248.1.

5.2 Naming conventions

5.2.1 CCU/BCU naming conventions

The MGC/MG can be named according to the naming structure of the underlying transport protocol carrying H.248.1.

5.2.2 Termination names

The Termination ID structure is provisioned in the MGC and MG and is known by the MG and the MGC at or before start up.

5.3 Topology descriptor

Topology Descriptor is to be supported by the BIWF and CSF.

5.4 Transaction timers

Any transaction timers as specified in ITU-T Rec. H.248.1 shall be supported.

5.5 Transport

The capability set shall support the transports defined in ITU-T Rec. Q.2150.0 [6].

5.6 Encoding

Binary and text encoding is supported.

5.7 Mandatory support of SDP and Annex C/H.248.1 information elements

5.7.1 Transmission Medium Requirements (TMR)

5.7.1.1 Annex C/H.248.1 Encoding

PropertyID: TMR
Property Tag: 0x9001
Description: The purpose of the Transmission Medium Requirement is to indicate the type of transmission medium required for the connection (e.g. 64 kbit/s unrestricted, speech).
Defined in: Local and Remote Descriptors
Type: Octet String
Possible Values: See 6.97/Q.1902.3 [5].

5.7.1.2 SDP Encoding

Description: This attribute is used as the means to convey the Transmission Medium Requirement to indicate the type of transmission medium required for the connection (e.g. 64 kbit/s unrestricted, speech).
Defined in: Local and Remote Descriptors
Possible Values:
The SDP encoding uses the media and bandwidth parameters of RFC 2327 [8] to encode this information. This encoding does not use direct mapping of the ISUP TMR octets into SDP. Table 1 below specifies the SDP to be used for each of the ISUP TMR values.

NOTE – "-" indicates "do not care" – i.e. the field should be set to any value valid according to SDP, but it is not used on the CBC interface.

Table 1/Q.1950 – SDP/ISUP TMR equivalence

ISUP TMR field (1 octet) (Ref. 6.97/Q.1902.3)	Description	SDP encoding
00000000	"speech"	`m=audio - - -` (Note that in this case the attributes in the media level description would be set to take account of "speech", e.g. echo cancellation settings etc.)
00000001	"spare"	No SDP coding required
00000010	"64 kbit/s unrestricted"	`m=data - - -` `b=AS:64`
00000011	"3.1 kHz audio"	`m=audio - - -` (Note that in this case, additional parameters in the media level description will give details of the codecs used (and implicit in these codecs, the bandwidth used))
00000100	Reserved for "alternate speech (service 2)/64 kbit/s unrestricted (service 1)"	See "64 kbit/s unrestricted".
00000101	Reserved for "alternate 64 kbit/s unrestricted (service 1)/speech (service 2)"	See "64 kbit/s unrestricted".
00000110	"64 kbit/s preferred"	`m=data - - -` `b=AS:64`
00000111	"2 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:128`
00001000	"384 kbit/s unrestricted"	`m=data - - -` `b=AS:384`
00001001	"1536 kbit/s unrestricted"	`m=data - - -` `b=AS:1536`
00001010	"1920 kbit/s unrestricted"	`m=data - - -` `b=AS:1920`
00010000	"3 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:192`

Table 1/Q.1950 – SDP/ISUP TMR equivalence

ISUP TMR field (1 octet) (Ref. 6.97/Q.1902.3)	Description	SDP encoding
00010001	"4 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:256`
00010010	"5 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:320`
00010011	"spare"	No SDP required
00010100	"7 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:448`
00010101	"8 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:512`
00010110	"9 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:576`
00010111	"10 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:640`
00011000	"11 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:704`
00011001	"12 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:768`
00011010	"13 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:832`
00011011	"14 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:896`
00011100	"15 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:960`
00011101	"16 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1024`
00011110	"17 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1088`
00011111	"18 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1152`
00100000	"19 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1216`
00100001	"20 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1280`
00100010	"21 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1344`
00100011	"22 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1408`
00100100	"23 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1472`
00100101	"spare"	No SDP required
00100110	"25 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1600`
00100111	"26 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1664`
00101000	"27 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1728`

Table 1/Q.1950 – SDP/ISUP TMR equivalence

ISUP TMR field (1 octet) (Ref. 6.97/Q.1902.3)	Description	SDP encoding
00101001	"28 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1792`
00101010	"29 × 64 kbit/s unrestricted"	`m=data - - -` `b=AS:1856`
00101011 through 11111111	"Spare"	No SDP required.

5.7.2 User Service Information (USI)

5.7.2.1 Annex C/H.248.1 Encoding

Property Name: USI
PropertyID: 0x9023
Description: The purpose of the User Service Information is to indicate a requested I.230 [3] bearer service to be provided by the network.
Defined in: Local and Remote Descriptors
Type: Octet String
Possible Values: The contents of the User Service Information is coded as shown in 6.102/Q.1902.3 [5].

5.7.2.2 SDP Encoding

Description: This attribute is used as the means to convey the User Service Information to the BIWF to identify the appropriate rate adaptation/compression algorithms to be used.
Defined in: Local and Remote Descriptors
Possible Values:
The encoding used is as follows:

a = isup_usi: <value of USI in hex digits as specified in 6.102/Q.1902 [5]>
The left most hex digit pair (e.g. EF in the following sequence EF 23 12 13) represents the first binary octet that would be transmitted as per 5.10/Q.1902.3.

5.7.3 Codec

5.7.3.1 Annex C/H.248.1 Encoding

Property ID: ACodec
Property Tag: 0x1006
Description: The purpose of the Codec Information is to indicate the type of voice encoding algorithm that is required for the connection.
Defined in: Local and Remote Descriptors
Type: Octet String
Possible Values: See 11.1.7/Q.765.5 for the format and the encoding of this string.

5.7.3.2 SDP Encoding

Description: The purpose of the Codec Information is to indicate the type of voice encoding algorithm that is required for the connection. The encoding of the audio Codec property uses the "vsel" and "codecconfig" attribute line parameters. This attribute is technology independent and can be used for SDP based codec negotiation irrespective of network type.
Defined in: Local and Remote Descriptors

Possible Values:
The general format of the "vsel" attribute line is shown below.

```
a = vsel:<encodingName #1> <packetLength #1><packetTime #1>
```

where:

`<encodingName>` represents the name of a codec e.g. G.711 (encoding names are based on IANA formats – see RFC 1890).

`<packetLength>` is a decimal integer representing the length of the packet in octets.

`<packetTime>` is a decimal integer representing the packetization interval in milliseconds.

In BICC networks the value of <packetLength> and <packetTime> shall be set to "-". Values others than "-" shall not be sent if received and shall be ignored.
The codec is listed within the vsel command.
The "codecconfig" attribute line parameter is used with codecs that require further specification of the characteristics of the codec as specified in ITU-T Rec. Q.765.5. This line is therefore optional. The format of the attribute line is as follows.

```
a = codecconfig <value of codec configuration as per ITU-T Q.765.5>
```

The symbols to be used for the codecs are maintained by IANA (along with the RTP Payload Types for those with statically mapped Payload Types).

5.7.4 Backbone Network Connection Identifier (BNC-ID)

5.7.4.1 Annex C/H.248.1 Encoding

Property ID: BIR
PropertyTag: 3002
Description: This property specifies the BNC-ID
Defined in: Local and Remote Descriptors
Type: Octet String (Maximum length 4 octets)
Possible Values: See 11.1.4/Q.765.5, "Backbone Network Connection Identifier", for the possible values and for the encoding of this string.

5.7.4.2 SDP Encoding

Description: This property specifies the BNC-ID, or End to End Call Identifier (EECID).
Defined in: Local and Remote descriptors.
Possible Values:
The value is encoded in the following SDP parameter format.

```
a = eecid:<eecid>
```

where <eecid> consists of up to 8 hex digits (equivalent to 4 octets).
The left most hex digit pair (e.g. EF in the following sequence EF 23 12 13) represents the most significant binary octet in the textual encoding.

5.7.5 BIWF Address

5.7.5.1 Annex C/H.248.1 Encoding

Property Tag: NSAP
PropertyID: 3003
Description: The address of the peer Bearer Interworking Function.
Defined in: Local and Remote Descriptors
Type: Octet String (Maximum length 20 octets)
Possible Values: NSAP. See 11.1.5/Q.765.5, "Interworking Function Address", for the possible values and for the encoding of this string.

5.7.5.2 SDP Encoding

Description: The address of the peer bearer interworking function.
Defined in: Local and Remote descriptors.

Possible Values:
The text encoding of the BIWF address is based upon the SDP connection line parameter as defined in RFC 2327. The format of the encoding is as follows.

c= <NetworkType> **<AddressType> <Address>**

Independent of the <NetworkType>, the format of <Address> is dependent on the <AddressType> as follows:

<AddressType>	**Format of <Address>**
NSAP	NSAP format in hexadecimal digits, optionally with "." between each 4 digits

Note that while SDP allows for the various address types as shown, the BIWF address for use in BICC messaging is the NSAP format.

5.8 Required standard packages

The following packages are to be used by this BICC Capability Set:

Basic BICC functionality (Mandatory):

- E.1/H.248.1 Generic v1
- E.2/H.248.1 Base Root Package v1

Optional BICC functionality (depending upon the network services deployed in the network):

- E.3/H.248.1 Tone Generator Package v1
- E.4/H.248.1 Tone Detection Package v1
- E.5/H.248.1 Basic DTMF Generator Package v1
- E.6/H.248.1 DTMF Detection Package v1
- E.7/H.248.1 Call Progress Tones Generator Package v1
- H.248.7 Generic Announcement Package v1
- E.13/H.248.1 TDM Circuit Package v1

The properties, signal, events and statistics correspond to the signalling objects as shown in 4.4.

5.9 BICC Packages

The following is a list of new packages that this capability set of BICC introduces:

Basic BICC Functionality (Mandatory):

- Bearer Characteristics Package, A.3
- Bearer Network Connection Cut Through Package, A.4
- Generic Bearer Connection Package, A.6

Optional BICC functionality (depending upon the network services deployed in the network):

- Reuse Idle Package, A.5
- Bearer Control Tunnelling Package, A.7
- Basic Call Progress Tones Generator with Directionality, A.8
- Expanded Call Progress tones Generator Package, A.9
- Basic Services Tones Generation Package, A.10
- Expanded Services Tones Generation Package, A.11

- Intrusion Tones Generation Package, A.12
- Business Tones Generation Package, A.13

In defining BICC packages the following rules have been applied to determine whether a new information element is a property or a signal parameter and to which descriptor it resides:

- A new information element is defined in the Local/Remote descriptors if it relates directly to the media and its encoding. For example: a codec relates directly to the media stream.
- A new information element is defined in the Local Control descriptor if it relates to the relationship between the CSM and the BIWF.
- A new information element is defined as a Signal parameter if:
  - The information element does not relate to the encoding of the media stream. For example: the codec is not contained in the EstablishRequest signal as it is contained in the Local/Remote Descriptor.
  - The information element is transient. For example: Bearer Control signalling occurs and the MG returns to its previous state. An announcement plays and the MG returns to its previous state.
- A new Event and its parameter is defined if no other existing event is suitable for use.

6 CBC Procedures

6.1 Nomenclature

The CSM uses X = ? to indicate that the CSM requests the BIWF to provide an appropriate value for signalling object (X).

The X = Y is used to indicate that the BIWF/CSM should set the signalling object (X) to value (Y).

Notification Requested "zzz" is used to request the BIWF to notify the CSM when event "zzz" has been detected. The Notification Requests are shown in the relevant transactions however the request for notification may be provisioned and when the termination is instantiated the request for indication will become active.

Signal Requested "www" is used to request the BIWF to send a signal "www" on the specified termination.

Event = "vvv" is used by the BIWF to indicate that a particular event "vvv" has been detected on a termination.

(…, Transaction) is used to indicate that this transaction can be sent in conjunction with another transaction.

X = Y/Z, is used to indicate a choice for X: Y or (exclusive) Z.

X = Y + Z, is used to indicate a choice for X: Y and/or (inclusive) Z.

X = Y & Z, is used to indicate: Y and Z.

…, is used to indicate an optional continuing list.

Brackets () are used to indicate boolean priority e.g. X = (Y/Z) + (M/N)

Some signalling objects are optional to carry in a transaction, this "optionality" is indicated by an underlined text statement before the object in the tables in 7.1 and 7.2.

Termination Ids in commands may be wild carded so that the one command will be applied to several terminations.

6.2 CBC procedures and encoding

The procedures in clauses 7 and 8 indicate which H.248.1 commands are used to perform an action and how they relate to transactions. The transaction name, e.g. *"Change_Topology"* is not encoded. The command and the information elements described in the tables in the procedures section are encoded as per clause 10. Transactions shall be validated according to the rules of H.248.1.

ITU-T Rec. H.248.1 provides general mechanisms to optimize the number of messages sent. The procedures and associated transactions listed in clauses 7 and 8 provide the necessary information flows to achieve an action. These information flows may be further optimized as indicated below.

6.2.1 Multiple transactions in a message

ITU-T Rec. H.248.1 has the capability of carrying several transactions in one H.248.1 message. The CSF and BIWF may choose to optimize the number of messages sent by placing more than one transaction in a message. For example: the CSF sends a Command request in Message 1 (transaction 1). The BIWF sends a Notify.ind in Message 2 (transaction 2). The BIWF then sends a Command response in Message 3 (transaction 1). The CSF sends a Notify.resp in Message 4 (transaction 2). This procedure could be optimized by sending a single message containing the Notify.ind (transaction 2) and the Command.resp (transaction 1).

6.2.2 Notification requests, events and the BIWF

The CSF may order the BIWF to detect events at any time, according to the rules of ITU-T Rec. H.248.1. However, rather than sending multiple Notification requests in multiple MOD.reqs over the life of the termination in a particular context the CSF may elect to put all Notification Requests in the initial ADD.req for the termination when adding it to a context. This will have the effect of keeping those Notification Requests active for the life of the termination in a context. The Notification Requests may also be provisioned on a termination. The CSF may remove a Notification Request at any time according to the rules of event handling in ITU-T Rec. H.248.1.

7 CBC procedures – Call related

This clause contains the Call Related procedures for the CBC protocol.

7.1 CSM transactions

The following transactions are used to indicate that a procedure is to be initiated by the CSM. These transactions lead to commands being sent across the CBC interface.

Table 2/Q.1950 – Call related CSM originated transactions on the CBC interface

Transaction	Description
Change_Topology	This transaction is used to change the connection topology within the BIWF. It describes the flow of user data internally to the BIWF. It may be used in cases where monitoring is required.
Confirm_Char	This is used to indicate to the BIWF that it should now use the indicated bearer service characteristics and that the BIWF can release resources associated with bearer service characteristics no longer used.
Cut_BNC	This is used to indicate to the BIWF that it should initiate a bearer release.
Cut_Through	This is used to indicate to the BIWF that cut-through of the bearer should occur.
Detect_Digit(s)	This transaction is used to indicate to the BIWF that it should prepare the necessary resources to detect a DTMF digit and report the occurrence of the digit to the CSM.

Table 2/Q.1950 – Call related CSM originated transactions on the CBC interface

Transaction	Description
Echo Canceller	This primitive is used to indicate the BIWF that it should associate echo canceller resources with the BNC.
Establish_BNC_notify	This is used to indicate to the BIWF that it should initiate a bearer setup.
Insert_Announcement	This is used to insert an announcement on a particular termination/s in the BIWF.
Insert_Digit(s)	This is used to insert DTMF digit/s on a particular termination/s in the BIWF.
Insert_Tone	This is used to insert a tone on a particular termination/s in the BIWF.
Isolate	This transaction is used to isolate one termination from other terminations effectively stopping media flow between the isolated termination and existing terminations. This is used when services like Call Hold are supported.
Join	This transaction is used to join one or more terminations establishing media flow between the terminations. This is used when services like Conferencing or 3 party are supported.
Modify_Char	This is used to indicate to the BIWF that it should initiate a change in the bearer service characteristics. I.e. Change of codec, Bearer Service.
Prepare_BNC_notify	This is used to indicate to the BIWF that it must be prepared to receive a bearer setup request.
Reserve_Char	This is used to indicate to the BIWF that it should allocate the necessary bearer resources for a particular codec or bearer service characteristic.
Reuse_Idle	This is used to indicate that reuse of an idle bearer should be attempted.
Tunnel	The tunnel transaction allows the: CSM to indicate to the BIWF that Bearer Control Tunnelling is available. BIWF to indicate to the CSM direction that Bearer Control Tunnelling shall be used for a particular termination. Passing from BIWF to CSM a Bearer Control Protocol data unit relating to a particular termination for transport to the peer termination.

7.1.1 Prepare_BNC_notify

When the transaction *"Prepare_BNC_notify"* is required the following procedure is initiated.

An ADD.req, MOD.req or MOV.req command is sent with the following information.

1 ADD.req/MOD.req/MOV.req (Prepare_BNC_notify) CSM to BIWF

Address information	**Control information**	**Bearer information**
If required: T-BIWF-Address = "?"	Transaction ID = z If termination requested: Termination ID = ? If termination provided: Termination ID = bearer1 Logical Port ID = y Notification_Requested (Event ID = x, "All BNC events") If Context Requested: Context ID = ? If Context Provided: Context ID = c1 If Forward Establishment: BNC-cut-through-capability =?	If CSF chosen: BNC characteristics = chosen characteristics If BIWF chosen: BNC characteristics = ? A-BNC Characteristics If NOT (Forward Establishment & Tunnelling = option 1): BNC-id = ? If No Codec Negotiation Bearer Service Characteristics If Codec Negotiation Codec Optionally if Forward Establishment & Tunnelling = option 1: BIWF-Addr = x BNC-ID = x1

Upon reception of the command, the BIWF shall:

- Assign a context ID if requested.
- Assign a termination ID based upon logical port ID, the preferred BNC characteristics and optionally a Bearer Service Characteristics or Codec.
- If requested assign a BNC-id.
- In the case of forward establishment and tunnelling option 1 the BIWF will use the provided BIWF-Addr and BNC-ID.
- If the case of forward establishment and tunnelling option 1 is not used, be prepared to accept a Bearer Establishment request.
- Be prepared to notify the CSM that a bearer is connected.
- In the case that this is the second termination in the context, the BIWF performs an analysis of the two terminations and determines whether a transcoder is required between the termination. If a transcoder is required, it is reserved for this purpose.
- The BIWF will determine whether or not the cut through for the requested bearer technology shall occur early or late.

Upon completion of processing command (1) an ADD.resp, MOD.resp or MOV.resp command (2) is sent.

2 ADD.resp/MOD.resp/MOV.resp BIWF to CSM

Address information	Control information	Bearer information
If requested: T-BIWF-Adress = X	Transaction ID = z Termination ID = bearer1 Context ID = c1 If requested: BNC-cut-through-capability = early/late	If NOT (Forward Establishment & Tunnelling = option 1): BNC-ID= x1 If BIWF Chosen: BNC Characteristics = chosen characteristics

7.1.2 Establish_BNC_notify

When the transaction *"Establish_BNC_notify"* is required the following procedure is initiated.

An ADD.req, MOD.req or MOV.req command is sent with the following information.

1 ADD.req/MOD.req/MOV.req (Establish_BNC_notify) CSM to BIWF

Address information	Control information	Bearer information
T-BIWF-Address = X	Transaction ID = z NotificationRequested (Event ID = x,"All BNC Events") Signal = BNC Establish If the context is provided: Context ID = c1 If the context is NOT provided: Context ID = ? If Termination Requested: Termination ID = ? If requested: Logical Port ID = y If Termination Provided: Termination ID = bearer1 If Tunnelling can be used: NotificationRequested (Event ID = x, "Tunnel Indication = x")	BNC-id = x1 If Termination Requested: BNC Characteristics A-BNC Characteristics If No Codec Negotiation: Bearer Service Characteristics If Codec Negotiation: Codec

Upon reception of the command, the BIWF shall:

- Assign a context ID if requested.
- Assign a termination based upon the preferred BNC characteristics and optionally the Bearer Service Characteristics or Codec if requested.
- Generate a Bearer Setup Request to the destination specified by the BIWF-Address using the provided BNC-id.
- If tunnelling is applicable, use the CBC interface to tunnel Bearer Control Messages.
- In the case that this is the second termination in the context, the BIWF performs an analysis of the two terminations and determines whether a transcoder is required between the termination. If a transcoder is required, it is reserved for this purpose.

Upon completion of processing command (1) an ADD.resp, MOD.resp or MOV.resp command (2) is sent.

2	ADD.resp, MOD.resp, MOV.resp		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Termination Requested: Termination ID = bearer1	

7.1.3 Cut_Through

The cut through transaction is used to through connect or break media on the terminations. The Cut_Through primitive can be used for this purpose in two ways. The implicit cut through is used when the termination is instantiated to allow the BIWF to control when the cut through of the media occurs. The explicit cut through is used when the CSM wants to control when the cut through of the media on the terminations occurs. To break the user plane the explicit cut through is used. The cut through transactions should be applied to the terminations that need to be cut through.

7.1.3.1 BIWF Controlled (Implicit)

When the transaction *"Cut_Through"* is required the following procedure is initiated.

1	ADD.req/MOD.req/MOV.req (…, Cut_Through)		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		As per flow (1) 7.1.1 Prepare_BNC_notify or 7.1.2 Establish_BNC_notify With the following addition: Cut Through Direction = direction If Notification of Cut through is required: NotificationRequested = (Event ID = x,"Cut Through")	

Upon reception of the command, the BIWF shall:

- When the BIWF receives the request for the termination "bearer1" with the cut through direction set to indicate through connection (forward, backward, both, inactive), the BIWF will wait until a Bearer SetupRequest or Bearer Setup Connect is sent or received. It will through connect the logical port represented by termination "bearer1".
- It will indicate the acceptance of the task to the CSM with information flow (2). The BIWF will send the indication of cut-through as per 7.2.3.1.

Upon completion of processing command (1) an ADD.resp/MOD.resp or MOV.resp is sent.

2	ADD.resp/MOD.resp/MOV.resp		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		As per flow (2) 7.1.1 Prepare_BNC_notify or 7.1.2 Establish_BNC_notify	

7.1.3.2 CSM Controlled (Explicit)

When the transaction *"Cut_Through"* is required the following procedure is initiated.

1	MOD.req/MOV.req (Cut_Through)		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Termination ID = bearer1 Context ID = c1 Cut Through Direction = forward, backward, both, inactive Transaction ID = z	

Upon reception of the command, the BIWF shall:

- When the BIWF receives the request for the terminations "bearer1" with the cut through direction set to forward, backward, both, inactive, the BIWF will through connect the logical port represented by termination "bearer1". More than one termination may be included in the same transaction to through connect several terminations simultaneously.
- It will indicate the acceptance of the request to the CSM with information flow (2).

Upon completion of processing command (1) a MOD.resp/MOV.resp is sent.

2	MOD.resp/MOV.resp		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Termination ID = bearer1	

7.1.4 Modification of Bearer Characteristics

7.1.4.1 Reserve_Char

This transaction is used on the termination that originates the bearer level modification. When the transaction "*Reserve_Char*" is required the following procedure is initiated.

1	MOD.req (Reserve_Char)		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1 Context ID = c1 NotificationRequested (Event ID = x, "BNC modified/BNC Mod Failed") Signal = BNC Modify Reserve_Value	If Non Codec Negotiation Bearer Service Characteristics If Codec Negotiation Codec/s – New and Old

Upon reception of the command, the BIWF shall:

- When the BIWF receives the request to modify the Bearer Characteristics for the termination it shall reserve resources for the characteristics of the bearer associated with the termination. The BIWF shall analyse whether new transcoding equipment is required between the termination "bearer1" and any other terminations in a context. If transcoding is required the BIWF shall insert transcoding equipment. The BIWF will analyse the bandwidth needs of the new codec or bearer service characteristic and initiate a Bearer Modify Request information flow to modify the bandwidth if the value to be reserved requires a greater bandwidth.
- Modify the codec profile being used on the connection to the new codec by sending a Bearer Modify Request information flow.

- As the Reserve_Value indication is sent, allocates the resources required for the support of multiple values of bearer information. For example if 2 codecs are sent then the resources to support both are reserved.

Upon completion of processing command (1) a MOD.resp is sent.

2	**MOD.resp**		**BIWF to CSM**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1 Context ID = c1	

7.1.4.2 Confirm_Char

This transaction is used on the termination that originates the bearer level modification. When the transaction *"Confirm_ Char"* is required the following procedure is initiated.

1	**MOD.req (Confirm_Char)**		**CSM to BIWF**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1 Context ID = c1 Signal = BNC Modify If reverting to the original codec: NotificationRequested (Event ID = x, "BNC modified/BNC Mod Failed")	If Non Codec Negotiation Bearer Service Characteristics If Codec Negotiation Codec

Upon reception of the command, the BIWF shall:

- When the BIWF receives the request to confirm the modification of the Bearer Characteristics for the termination it shall modify the characteristics of the bearer associated with the termination according to the provided Codec or Bearer Service Characteristic. When the u-plane no longer needs the bandwidth the BIWF may initiate the Bearer Modify Request information flow to reduce the bandwidth if the previously reserved bandwidth is greater than what is needed.

Upon completion of processing command (1) a MOD.resp is sent.

2	**MOD.resp**		**BIWF to CSM**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1 Context ID = c1	

7.1.4.3 Modify_Char

This transaction is used on the termination that terminates the bearer level modification. When the transaction *"Modify_Char"* is required the following procedure is initiated.

1	MOD.req (Modify_Char)		CSM to BIWF
	Address information	**Control information** Transaction ID = z Termination ID = bearer1 Context ID = c1 If multiple values of Bearer Information are required: Reserve_Value	**Bearer information** Non Codec Negotiation Bearer Service Characteristics If Codec Negotiation Codec/s

Upon reception of the command, the BIWF shall:

- When the BIWF receives the request to modify the Bearer related Characteristics for the termination it shall modify the characteristics of the bearer associated with the termination. The BIWF shall analyse whether new transcoding equipment is required between the termination "bearer1" and any other terminations in the context and includes any required transcoding equipment. The BIWF will inform the CSM that the task is completed with information flow (2).
- If the Reserve_Value indication is sent, reserve the resources required to support multiple values of bearer information. For example if 2 codecs are sent then the resources to support both are reserved.
- The BIWF should take relevant actions to ensure smooth transition to the new encoding.

Upon completion of processing command (1) a MOD.resp is sent.

2	MOD.resp		BIWF to CSM
	Address information	**Control information** Transaction ID = z Termination ID = bearer1 Context ID = c1	**Bearer information**

7.1.5 Tunnel

This transaction is used to carry the "Bearer Information Transport information" from the CSF to the BIWF. It is also used to indicate to the MG that a Bearer Information Transport tunnel can be used. The "Bearer Information Transport" information can be carried in a stand alone transaction or can be carried as part of a transaction used for another purpose, for example "Establish_BNC_notify". The Tunnel transaction may be associated with another transaction. E.g. Establish_BNC_notify. Likewise the response to a transaction may be associated with another transaction. E.g. It is possible for an ADD.resp (Establish_BNC_notify) and a NOTIFY.ind(x) to share the same message.

When the transaction "*Tunnel*" is required the following procedure is initiated.

1	ADD.req/MOD.req/MOV.req (…,Tunnel)		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		As per the transaction that this is combined with (i.e. "Establish_BNC_notify" and "Prepare_BNC_notify"), with the following addition: Tunnel Option = ?/no/1/2 NotificationRequested (Event ID = x, "Tunnel Indication") **OR:** Transaction ID = z Context ID = c1 Termination ID = bearer1 Signal = Bearer Information Transport NotificationRequested (Event ID = x, "Tunnel Indication")	

Upon reception of the command, the BIWF shall:

- When Bearer Information Transport is received, act according to the information contained in the object. I.e. Process a Bearer SetupRequest.
- If a Tunnel indication is received, the BIWF shall depending on the option received to use a tunnel, choose to use a tunnel or choose NOT to use a tunnel. If the BIWF uses a tunnel it shall return the Bearer Information Transport in a NOTIFY.ind according to what type of response was requested.

Upon completion of processing command (1) an ADD.resp, MOD.resp, MOV.resp is sent.

2	ADD.resp, MOD.resp, MOV.resp		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		As per ("Establish_BNC_notify" and "Prepare_BNC_notify") **OR:** Transaction ID = z Context ID = c1 Termination ID = bearer1 If requested: Tunnel Option = no/1/2	

7.1.6 Reuse Idle

7.1.6.1 Establish_BNC_notify

When the transaction *"Establish_BNC_notify"* is required the BIWF may return in the response that an Idle Bearer is to be used. The following procedure is initiated.

1	ADD.req/MOD.req (Establish_BNC_notify)		CSM to BIWF
	Address information	**Control information**	**Bearer information**
	As per 7.1.2	As per 7.1.2	As per 7.1.2

Upon reception of the command, the BIWF shall:

- As per 7.1.2 information flow (1) with the following additions.
- If the BIWF determines that an idle bearer is to be used it will send an indication "reuse_Idle" and the BNC-ID of the idle bearer. If the CSM had requested the BIWF to choose a termination ID, the BIWF shall return the termination ID of the termination that relates to the idle bearer.

Upon completion of processing command (1) an ADD.resp, MOD.resp is sent.

2	**ADD.resp, MOD.resp**		**BIWF to CSM**
	Address information	**Control information**	**Bearer information**
		As per 7.1.2 with the following additions: Reuse-Idle_indication If Termination Requested: Termination ID = idle_bearer	BNC-id = BNC-ID of the idle bearer to be reused.

7.1.6.2 Reuse_Idle

When the transaction *"Reuse-Idle"* is required the following procedure is initiated.

1	**MOD.req (…, Reuse_Idle)**		**CSM to BIWF**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Termination ID = bearer1	BNC-id = BNC-ID of the idle bearer to be reused.

Upon reception of the command, the BIWF shall:

- Associate the Bearer represented by the BNC-id = "Reuse_Idle" with the termination indicated. This termination will now relate to the idle bearer.

Upon completion of processing command (1) an ADD.resp is sent:

2	**MOD.resp**		**BIWF to CSM**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Termination ID = bearer1	

7.1.7 Release

The transaction below shows Release where the BIWF combines multiple actions (i.e. bearer release signalling, breaks the connection and removes the termination) in one transaction. These actions may be achieved individually in their own transaction for:

- Bearer Release Signalling by sending a MOD.req and MOD.reply with a signal "BNC Release".
- Breaking the Connection by sending a MOD.req and MOD.reply indicating that the cut through direction is send/receive/inactive.
- Removing the termination by sending a SUB.req and SUB.resp.

7.1.7.1 Release

When the transaction "*Cut_BNC*" is required the following procedure is initiated. In this procedure the MOD.req/SUB.req are in the same transaction request. The response is also in the same transaction reply:

1	**MOD.req (Cut_BNC)**		**CSM to BIWF**
	Address information	**Control information**	**Bearer information**
		Transaction ID = x Context ID= c1 Termination ID = bearer1 Signal = BNC Release Release Cause = Cause Streammode = Send/Receive/Inactive If reset is required: Reset	

Upon reception of the command, the BIWF should:

- Break the connection path.
- Because there was a request to release the BNC:
  - If the BIWF originated the bearer connection, it also initiates the release of the bearer connection with a bearer release message. The resources associated (e.g. BNC-ID) with the bearer are not deleted until bearer release confirmation is received.
  - If the BIWF did not initiate the bearer connection the resources associated (e.g. BNC-ID) with the bearer are deleted on receipt of the bearer release message.
  - The resources associated with the termination are released.
- If as a result of a reset the Release Cause is forced, the BIWF shall clear all resources associated with the BNC and send a bearer release message/reset. The BIWF shall not reuse the BNC for any other calls.

2	**SUB.req (Cut_BNC)**		**CSM to BIWF**
	Address information	**Control information**	**Bearer information**
		Transaction ID = x Context ID= c1 Termination ID = bearer1	

Upon reception of the command, the BIWF shall:

- Release the termination.

Upon completion of processing command (1) a MOD.resp is sent:

3	**MOD.resp (Cut_BNC)**		**BIWF to CSM**
	Address information	**Control information**	**Bearer information**
		Transaction ID = x Context ID = c1	

Upon completion of processing command (2) a SUB.resp is sent:

4	**SUB.resp (Cut_BNC)**		**BIWF to CSM**
	Address information	**Control information**	**Bearer information**
		Transaction ID = x Context ID = c1	

7.1.7.2 Bearer Initiated Release

When the transaction "*Bearer Initiated Release*" is required, indicated by the BNC release event, the following procedure is initiated:

1	SUB.req (Cut_BNC)		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = x Termination ID = bearer1 Context ID = c1	

Upon reception of the command, the BIWF shall:

- Free the resources associated with termination ID "bearer1" and inform the CSM that this is complete with information flow (2).

Upon completion of processing command (1) a SUB.resp is sent:

2	SUB.resp (Cut_BNC)		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		Transaction ID = x Termination ID = bearer1 Context ID = c1	

7.1.8 Bearer Topology

In accordance with ITU-T Rec. H.248.1 when a termination is added to a context the default connection between terminations is "both way" unless indicated otherwise by a Topology change.

7.1.8.1 Isolate

When the transaction "*Isolate*" is required the following procedure is initiated:

1	MOV.req/ADD.req (…, Isolate)		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = z In the case of MOV: Termination ID = Bearer1 If context is NOT provided: Context ID = ? If the context is provided: Context ID = c1 In the case of ADD: Termination ID = ? Context ID = ?	

Upon reception of the command, the BIWF shall:

If a MOV request was received:

- It will move the termination from the context association where it is currently residing and move it to the provided context or a new context if not provided.
- When the termination is moved the BIWF will break any media connections in the existing context and when placed in the new context it shall be isolated. Once the termination is moved the BIWF shall send flow (2).

If an ADD request was received:

- It will isolate the termination with its own context association. As the termination is added to a context it has no previously established connections and will be isolated.

Upon completion of processing command (1) a MOV.resp or ADD.resp is sent:

2	**MOV.resp/ADD.resp**		**BIWF to CSM**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1 If requested: Context	

7.1.8.2 Join

When the transaction "*Join*" is required the following procedure is initiated:

1	**MOV.req/ADD.req (…, Join)**		**CSM to BIWF**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z If provided: Context ID = c1 If requested: Context ID = ? In the case of MOV: Termination ID = Bearer1 In the case of ADD: Termination ID = ?	

Upon reception of the command, the BIWF shall:

If a MOV request was received:

- move the termination from the context association where it is currently residing and move it to the provided context or a new context if not provided;
- break any media connections in the existing context and when placed in the new context it shall establish connections to the other terminations in the context association.

If an ADD request was received:

- add the termination to an existing context association. When placed in the context it shall establish connections to the other terminations in the context association.

Once the termination is moved or added the BIWF shall send flow (2).

Upon completion of processing command (1) a MOV.resp or ADD.resp is sent:

2	**MOV.resp/ADD.resp**		**BIWF to CSM**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1	

7.1.8.3 Change Connection Topology

In the CBC protocol the "*Change_Topology*" transaction is not used to "*Through_Connect*" two terminations. The through connection is achieved through the use of the "*Cut_Through*" transaction. In some cases the "Change Topology" transaction may not need to be sent. For example "Connection Configuration = Type 1 Bi-Dir" is represented by 2 terminations in one context, with their stream mode set to send/receive. If this situation already exists then sending "*Change_Topology*" is superfluous. When the transaction "Change_Topology" is required the following procedure is initiated:

1	MOV.req/ADD.req/MOD.req/SUB.req (…, Change_Topology)		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Connection Configuration = (TerminationID= x1, TerminationID=x2, [type = x]),…	

Upon reception of the command, the BIWF shall:

- change the state of the established connections in the context association. The streams associated with the terminations shall remain the same, however how they are connected internally in the BIWF shall change;
- change the connection according to TerminationID pairs provided in the request according to one of the connection configurations (type x). These connection configuration types are realized in the CBC interface by using the topology descriptor. By using terminationID pairs (one way, both way, isolate) the topology change is achieved. The direction of one way is from the first provided termination ID to the second termination ID.
  - When the state is "one way", user data shall only flow from one termination to the next.
  - When the state is "both way", user data shall have a bidirectional flow directly from one termination to the other.
  - When the state is "isolated" no data shall flow between the first termination to the second termination.

The change of topology on one termination shall not be visible on other terminations.

Once the BIWF has changed to the desired topology it will reply with flow (2).

Upon completion of processing command (1) a MOV.resp/ADD.resp/MOD.resp/SUB.resp is sent:

2	MOV.resp/ADD.resp/MOD.resp/SUB.resp		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		Transaction ID = z	

7.1.9 Echo Canceller

When the transaction "*Echo Canceller*" is required the following procedure is initiated:

1	ADD.req/MOD.req/MOV.req (…, Echo Canceller)		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Termination ID = x Cancel Echo = on/off	

Upon reception of the command, the BIWF shall:

- associate the relevant echo canceller resources with the specified termination.

Upon completion of processing command (1) a MOV.resp/ADD.resp/MOD.resp is sent:

2	ADD.resp/MOD.resp/MOV.resp		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1	

7.1.10 Media Content Insertion

7.1.10.1 Insert_Tone

When the transaction "*Insert_Tone*" is required the following procedure is initiated:

1	**MOD.req/ADD.req/MOV.req (Insert_Tone)**		**CSM to BIWF**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Signal Direction Signal Timing Signal = Tone.ID If Termination exists: Termination ID = bearer1 If Termination does NOT exist: Termination ID = ? If notification of tone completion is required: Notification required = (Event ID = x, "Signal.completion (Tone)")	

Upon reception of the command, the BIWF shall:

- insert the requested tone according to the Signal Direction and Signal Timing into the media stream associated with termination ID "bearer1", and returns the response information flow (2).
- If Signal.completion is requested when the tone finishes playing the BIWF will notify the CSM of completion of the signal.

Upon completion of processing command (1) a MOV.resp/ADD.resp/MOD.resp is sent:

2	**MOD.resp/ADD.resp/MOV.resp**		**BIWF to CSM**
	Address information	**Control information**	**Bearer information**
		Transaction-id = z Termination ID = bearer1 Context ID = c1	

7.1.10.2 Insert_Digit

When the transaction "*Insert_Digit*" is required the following procedure is initiated:

1	MOD.req/ADD.req/MOV.req (Insert_Digit)		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Signal Timing Signal = Digit/s If Termination exists: Termination ID = bearer1 If Termination does NOT exist: Termination ID = ? If notification of digits completed is required: Notification required (Event ID = x, "Signal.completion (Digit)")	

Upon reception of the command, the BIWF shall:

- Insert the requested digits according to the Signal Timing into the media stream associated with termination ID "bearer1", and returns the response information flow (2).
- If Signal.completion is requested when the digit finishes playing the BIWF will notify the CSM of completion of the signal.

Upon completion of processing command (1) a MOV.resp/ADD.resp/MOD.resp is sent:

2	MOD.resp/ADD.resp/MOV.resp		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1 Context ID = c1	

7.1.10.3 Insert_Announcement

When the transaction "*Insert_Announcement*" is required the following procedure is initiated:

1	ADD.req/MOD.req/MOV.req (Insert_Announcement)	CSM to BIWF
Address information	**Control information**	**Bearer information**
	Transaction ID = z Context ID = c1 Signal = Announcement ID Signal Direction Signal Timing If Announcement played on an existing termination: Termination ID = bearer1 If Announcement played on a new termination to existing Termination/s: Termination ID = ? Streammode = send only If notification of Announcement completion is required: Notification required (Event ID = x, "Signal.completion (Announcement)")	

Upon reception of the command, the BIWF shall:

If a MOD/MOVcommand is received with a termination ID specified:

- insert and play an announcement on the specified termination.

If an ADD command is received with a termination ID (?) not specified:

- the BIWF creates the announcement termination (Termination ID = ?), and connects it to the existing terminations associated with the context. The BIWF then inserts the requested announcement into the media stream.

The announcement is played according to the signal direction and timing received.

If Signal.completion is requested when the tone finishes playing the BIWF will notify the CSM of completion of the signal.

Upon completion of processing command (1) a MOV.resp/ADD.resp/MOD.resp is sent:

2	ADD.resp/MOD.resp/MOV.resp	BIWF to CSM
Address information	**Control information**	**Bearer information**
	Transaction ID = z Context ID = c1 If the termination ID was requested: Termination ID = announ1	

7.1.11 Media Content Detection

7.1.11.1 Detect_Digit

When the transaction "*Detect_Digit*" is required the following procedure is initiated:

---

1 MOD.req/ADD.req (…,Detect_Digit) CSM to BIWF

Address information	Control information	Bearer information
	Transaction ID = z Termination ID = bearer1 Context ID = c1 NotificationRequested (Event ID = x, "Detect_Digit (Digit,Timing)")	

Upon reception of the command, the BIWF shall:

- send flow (2) as an acknowledgment to the request;
- reserve resources associated with the detection of the DTMF digits and when the digit is detected the BIWF shall notify the CSM. If requested the BIWF shall also detect the end of a digit and notify the CSM.

Upon completion of processing command (1) an ADD.resp/MOD.resp is sent:

2 MOD.resp/ADD.resp BIWF to CSM

Address information	Control information	Bearer information
	Transaction ID = z Termination ID = bearer1 Context ID = c1	

7.2 BIWF Transactions

The following transactions are the transactions used to indicate that a procedure is to be initiated in the BIWF. These transactions map to events generated by the BIWF.

Table 3/Q.1950 – Call-related BIWF originated transactions on the CBC interface

Transaction	Description
BNC Connected	This transaction indicates that BNC has been connected.
BNC Established	This transaction indicates that a BNC has been established.
BNC Modification Failed	This transaction indicates that a Bearer Modification Request has failed.
BNC Modified	This transaction indicates that the Characteristics of a BNC have been changed.
BNC Release	This transaction indicates that a Bearer Release Request has been sent or that Bearer Establishment has failed.
Cut_Through	This transaction indicates that a BNC has been Cut-Through.
Detect_Digit	This transaction indicates that a Tone has been detected.
Tunnel	This transaction contains tunneled information from the BIWF.
Signal Completion	This transaction indicates that a signal has finished playing.

7.2.1 BNC Connected

When the transaction "*BNC Connected*" is required the following procedure is initiated.

A Notify.ind command is sent with the following information to indicate that a Bearer is established.

1 **Notify.ind (BNC Connected)** **BIWF to CSM**

Address information	Control information	Bearer information
	Transaction ID = z Termination ID = bearer 1 Event (Event ID = x,"BNC Connected") Context ID = c1	

Upon reception of the command, the CSM shall:

- Continue processing in the knowledge that the Bearer has been connected.

Upon completion of processing command (1) a Notify.resp is sent:

2 **Notify.resp** **CSM to BIWF**

Address information	Control information	Bearer information
	Transaction ID = z Context ID = c1	

7.2.2 BNC established

When the transaction "*BNC Established*" is required the following procedure is initiated.

A Notify.ind command is sent with the following information to indicate that a Bearer is established.

1 **Notify.ind (BNC Established)** **BIWF to CSM**

Address information	Control information	Bearer information
	Transaction ID = z Termination ID = bearer 1 Event (Event ID = x,"BNC Established") Context ID = c1	

Upon reception of the command, the CSM shall:

- Continue processing in the knowledge that the Bearer has been established.

Upon completion of processing command (1) a Notify.resp is sent:

2 **Notify.resp** **CSM to BIWF**

Address information	Control information	Bearer information
	Transaction ID = z Context ID = c1	

7.2.3 Cut_Through

7.2.3.1 BIWF Controlled (Implicit)

When the transaction "*Cut_Through*" is required the following procedure is initiated.

1	**Notify.ind**		**BIWF to CSM**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Termination ID = bearer1 Event (Event ID = x,"Cut Through")	

Upon reception of the Notify command, it is indicated that:

- cut-through has occurred.

Upon completion of processing command (1) a Notify.resp is sent:

2	**Notify.resp**		**CSM to BIWF**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Termination ID = bearer1	

7.2.4 BNC Modified

When the transaction "*BNC Modified*" is required the following procedure is initiated.

1	**Notify.ind (BNC Modified)**		**BIWF to CSM**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer 1 Event (Event ID = x, "BNC modified") Context ID = c1	

Upon reception of the Notify command, it is indicated that:

- The characteristics of the Bearer and its associated resources have been modified.

Upon completion of processing command (1) a Notify.resp is sent:

2	**Notify.resp**		**CSM to BIWF**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Termination ID = bearer1	

7.2.5 BNC Modification Failed

When the transaction "*BNC Modification Failed*" is required the following procedure is initiated.

1	Notify.ind (BNC Modified)		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer 1 Event (Event ID = x, "BNC Mod Failed") Context ID = c1	

Upon reception of the Notify command, it is indicated that:

- The modification of bearer resources has failed.

Upon completion of processing command (1) a Notify.resp is sent:

2	Notify.resp		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Termination ID = bearer1	

7.2.6 BNC Release

When the transaction "*BNC Release*" is required the following procedure is initiated.

1	Notify.ind (BNC Release)		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1 Event (Event ID = x, "BNC Release (Cause)") Context ID = c1	

Upon reception of the Notify command, it is indicated that:

- A Bearer Release Request has been received or that a Bearer Establishment has failed.

Upon completion of processing command (1) a Notify.resp is sent:

2	Notify.resp		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1	

7.2.7 Tunnel

When the transaction "*Tunnel*" is required the following procedure is initiated.

1	Notify.ind		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1 Context ID = c1 Event (Event ID = x,"Bearer Information Transport")	

Upon reception of the Notify command, it is indicated that:

- The CSM shall take the "Bearer Information Transport" and send it to a peer node.

Upon completion of processing command (1) a Notify.resp is sent:

2	Notify.resp		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1, Context ID = c1	

7.2.8 Signal Completion

When the transaction "*Signal Completion*" is required the following procedure is initiated.

1	Notify.ind (Signal Completion)		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1 Event =(Event ID = x, "Signal.Completion(y)") Context ID = c1	

Upon reception of the Notify command, it is indicated that:

- The signal represented by "y", i.e. ToneID, AnnouncementID etc. has finished playing.

Upon completion of processing command (1) a Notify.resp is sent:

2	Notify.resp		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID =c1	

7.2.9 Digit Detected

When the transaction "*Detect_Digit*" is required the following procedure is initiated.

1	Notify.ind (Detect_Digit)		BIWF to CSM
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Termination ID = bearer1 Context ID = c1 Event (Event ID = x, "Detect_Digit (Digit, Timing)")	

Upon reception of the Notify command, it is indicated that:

- The start of or end of digit/s have been detected by the BIWF. The digits detected are indicated in the response.

2	Notify.resp		CSM to BIWF
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1	

8 CBC procedures – General

8.1 General CBC procedure information

8.1.1 BIWF/termination unavailable

The CSM should set a BIWF/Termination in Service State "Unavailable" when the CSM discovers that the BIWF/Termination is unavailable, e.g. due to:

1) Signalling transport restrictions;

2) Receipt of a service cancellation indication for the BIWF or specified terminations.

The CSM should refrain from establishing any new connections to the BIWF/Termination and send the necessary indications, until the CSM discovers that the BIWF/Termination is available again, e.g. due to the fact that:

1) The signalling transport restrictions are removed and the CCU starts a timer Tw. Tw is used to supervise the reception of recovery indications from the BIWF.

2) The BIWF/Termination reports a **Service Change** for the BIWF/Termination indicating that service has been restored;

3) At expiry of Tw, the sending of an audit of the BIWF/Termination results in a response.

The CSM should then set the BIWF/Termination in Service State "Available" and send the necessary indications for the terminations.

8.1.2 Audit of BIWF

When auditing a BIWF it should be noted that four (4) different types of audits are possible:

1) Audit of the BIWF level;

2) Audit of the default characteristics of Ephemeral Terminations;

3) Audit of all Physical Termination(s) in the Null Context;

4) Audit of all Ephemeral/Physical Termination(s) in the Context.

An audit of the BIWF level (1) is performed by indicating ALL as the Context ID and Root as the Termination ID. Such an audit will return Packages and Properties realized on the BIWF level as well as a list of all the Context IDs.

If the requesting audit command **AuditValue/AuditCapabilities** includes an Empty AuditDescriptor when Terminations are audited (2)-(4), a list of Terminations is returned. This may be useful when using wildcards (ALL) for Terminations.

Terminations not in use (2) are audited by means of indicating ALL as the Context ID and ALL as the Termination ID.

An audit of Physical Terminations in the Null Context (3) is performed by indicating Null as Context ID and the specific Termination ID or a wildcarded (ALL) Termination ID.

An audit of Physical/Ephemeral Terminations in a specific Context (4) is performed by indicating the specific Context as Context ID and the specific Termination ID or a wildcarded (ALL) Termination ID.

8.2 CSM transactions

The following transactions are used to indicate that a procedure is to be initiated by the CSM. These transactions lead to commands being sent across the CBC interface.

Table 4/Q.1950 – General CSM originated Transactions on the CBC interface

Transaction	Description
Audit_Values	This transaction is used by the CSM to audit the Packages, the Events, the Signals and the current Property Values realized by Termination(s) or the BIWF.
Audit_Capabilities	This transaction is used by the CSM to audit the Events, the Signals and the possible Property Values realized by Termination(s) or the BIWF.
CCU Ordered BIWF Re-Registration	This transaction is used by the CSM to order that the BIWF re-register itself with a CSM.
CCU Initiated Service Restoration	This transaction is used by the CSM to indicate that it has been restored to Service.
CCU Initiated Service Cancellation	This transaction is used by the CSM to indicate that it will be removed from Service.

8.2.1 CSM service changes

8.2.1.1 CCU ordered BIWF re-registration

When the transaction "*CCU Ordered BIWF Re-Registration*" is required, the following procedure is initiated.

A ServiceChange.req command is sent with the following information.

1 ServiceChange.req (CCU Ordered BIWF Re-Registration) CCU to BIWF

Address information	**Control information**	**Bearer information**
Use New CCU Control Address: Service Change MGCID = CCU Control Address	Transaction ID = z Context ID = Value not significant Termination ID = Root Service Change Reason = MGC Directed Change Service Change Method = Handoff	

Upon reception of the command in the BIWF:

- If a New CCU Control Address was received, this is replacing the stored one after the subsequent response and is used for later communication with the CCU.
- The BIWF returns a command response (2).
- The BIWF then re-registers itself as shown in 8.3.1.2 "BIWF Re-Registration".

Upon completion of processing command (1) a ServiceChange.resp command (2) is sent.

2 ServiceChange.resp BIWF to CCU

Address information	**Control information**	**Bearer information**
	Transaction ID = z Context ID = Value not significant Termination ID = Root	

Upon reception of the command in the CCU:

- The CCU waits for the BIWF Registration procedure to be initiated, as shown in 8.3.1.1 "BIWF Registration".

8.2.1.2 CCU Initiated Service Restoration

When the transaction "*CCU Initiated Service Restoration*" is required the following procedure is initiated.

A ServiceChange.req command is sent with the following information.

1 ServiceChange.req (CCU Initiated Service Restoration) CCU to BIWF

Address information	Control information	Bearer information
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL Service Change Reason = Cold Boot/Warm Boot Service Change Method = Restart Delay: Service Change Delay = Delay	

Upon reception of the command in the BIWF:

- If the Service Change Reason is Cold boot the BIWF moves all physical terminations to null context and remove all ephemeral terminations. NotifyRequest(s) are stopped and physical terminations withdrawn from traffic are reported in ServiceChange request(s).
- A command response (2) is sent.

After the Delay, the BIWF can regard the Service State of the Termination(s) or the CCU as In Service.

Upon completion of processing command (1) a ServiceChange.resp command (2) is sent.

2 ServiceChange.resp BIWF to CCU

Address information	Control information	Bearer information
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL	

Upon reception of the command in the CCU it continues call processing.

8.2.1.3 CCU Initiated Service Cancellation

When the transaction "*CCU Initiated Service Cancellation*" is required the following procedure is initiated.

A ServiceChange.req command is sent to all registered BIWFs with the following information.

1 ServiceChange.req (CCU Initiated Service Cancellation) CCU to BIWF

Address information	Control information	Bearer information
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL Service Change Reason = For Terminations: Termination Taken Out Of Service For a CCU: MGC Impending Failure Service Change Method = Graceful/Forced Delay: Service Change Delay = Delay	

Upon reception of the command in the BIWF:

- sends a command response (2);
- starts to tear down existing connections on the Termination(s) or the BIWF, gracefully or by force, with or without a Delay, as requested;
- when no Delay is indicated for a graceful tear down, the BIWF is to wait for the natural removal of the existing connections.

After the Delay, the BIWF can regard the Service State of the Termination(s) or the whole CCU as Out Of Service.

Upon completion of processing command (1) a ServiceChange.resp command (2) is sent.

2 ServiceChange.resp BIWF to CCU

Address information	Control information	Bearer information
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL	

Upon reception of the command in the CCU, it continues call processing.

8.2.2 Audit of BIWF Service Capabilities

8.2.2.1 Audit_Values

When the transaction "*Audit_Values*" is required the following procedure is initiated.

An AUD_VAL.req command is sent with the following information.

1 AUD_VAL.req (Audit_Values) CCU to BIWF

Address information	**Control information**	**Bearer information**
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL Audit Descriptor = Empty/ Audit Token = Digit Map + (Packages/(Mux + Modem + Events + Signals + Media))	

Upon reception of the command in the BIWF:

The BIWF returns a command response (2) with the Digit Map/Package/Property Names and Values realized by the Termination(s) or the BIWF level, as requested:

- When Packages are requested, the Package Names and Versions are returned, while the Mux Type and the multiplexed Termination IDs are returned for the Mux Descriptor.
- The Descriptors for Modem/Media/Termination State/Local Control/Local/Remote returns the current Property Value while the Descriptors for Signals/Events returns all possible/allowed Signal/Event Parameter Names and Values.
- The Service State returns the current Service State.
- When Terminations are audited, an Empty AuditDescriptor returns a list of Terminations.

Several command requests (1) and responses (2) might be required to return all information requested.

Upon completion of processing command (1) the BIWF returns AUD_VAL.resp command(s) (2).

2	**AUD_VAL.resp**		**BIWF to CCU**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL Empty Audit Descriptor: – AuditToken = Digit Map: Digit Map Descriptor = Digit Map Name + Value AuditToken = Packages: Packages Descriptor = Package Names + Versions AuditToken = Mux: Mux Descriptor = Mux Type + All: Mux'ed Termination IDs AuditToken = Modem: Modem Descriptor = Modem Types + Package & Property Names + Current Property Value AuditToken = Events: Event Descriptor = Package & Event Names + Possible Event Parameter: Names + Values AuditToken = Signals: Signal Descriptor = Package & Signal Names + Possible Signal Parameter: Names + Values AuditToken = Media: Service State = Current Service State Termination State Descriptor = Package & Property Names + Current Property Value Local Control Descriptor = Package & Property Names + Current Property Value Local Descriptor = Package & Property Names + Current Property Value Remote Descriptor = Package & Property Names + Current Property Value	

8.2.2.2 Audit_Capabilities

When the transaction "*Audit_Capabilities*" is required the following procedure is initiated.

An AUD_CAP.req command is sent with the following information.

1	AUD_CAP.req (Audit_Capabilities)	CCU to BIWF
Address information	**Control information**	**Bearer information**
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL Audit Descriptor = Empty/ Audit Token = Mux + Modem + Events + Signals + Media	

Upon reception of the command in the BIWF:

The BIWF returns a command response (2) with the Property Names and Values realized by the Termination(s) or the BIWF level, as requested:

- The Descriptors for Modem/Media/Termination State/Local Control/Local/Remote/Signal/Event returns all possible/allowed Names and Values for the Property/Signal Parameter/Event Parameter, while the Mux Type and the multiplexed Termination IDs are returned for the Mux Descriptor.
- The Service State returns the possible Service States.
- When Terminations are audited, an Empty AuditDescriptor returns a list of Terminations.

Several command requests (1) and responses (2) might be required to return all information requested.

Upon completion of processing command (1) the BIWF returns AUD_CAP.resp command(s) (2).

2	**AUD_CAP.resp**		**BIWF to CCU**
	Address information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL Empty Audit Descriptor: – AuditToken = Mux: Mux Descriptor = Mux Type + All: Mux'ed Termination Ids AuditToken = Modem: Modem Descriptor = Modem Types + Requested: Package & Property Names + Possible Property Values AuditToken = Events: Event Descriptor = Package & Event Names + Possible Event Parameter: Names + Values AuditToken = Signals: Signal Descriptor = Package & Signal Names + Possible Signal Parameter: Names + Values AuditToken = Media: Service State = Possible Service States Termination State Descriptor = Package & Property Names + Possible Property Values Local Control Descriptor = Package & Property Names + Possible Property Values Local Descriptor = Package & Property Names + Possible Property Values Remote Descriptor = Package & Property Names + Possible Property Values	

8.3 BIWF transactions

The following transactions are the transactions used to indicate that a procedure is to be initiated in the CCU. These transactions map to events and ServiceChanges generated by the BIWF.

Table 5/Q.1950 – General BIWF originated transactions on the CBC interface

Transaction	Description
BIWF_Capability_Change	This transaction is used by the BIWF to indicate to the CSM that the capabilities of Termination(s) or the BIWF are changed.
BIWF_Lost_Communication	This transaction is used by the BIWF to indicate to the CSM that the BIWF has lost but subsequently restored the communication with the CCU, but there is a risk that this has caused a possible information mismatch between the BIWF and the CSM.
BIWF_Registration	This transaction is used by the BIWF to register with a CSM.
BIWF_Re-Registration	This transaction is used by the BIWF to reregister with a CSM after the CSM has ordered reregistration or handoff.
BIWF_Service_Cancellation _Indication	This transaction is used by the BIWF to indicate to the CSM that Termination(s) on the BIWF or the BIWF are to be taken out of service.
BIWF_Service_Restoration_ Indication	This transaction is used by the BIWF to indicate to the CSM that Termination(s) on the BIWF or the BIWF are to be taken into service.

8.3.1 BIWF Service Changes

8.3.1.1 BIWF_Registration

When the transaction "*BIWF_Registration*" is required the following procedure is initiated.

A ServiceChange.req command is sent with the following information.

1 ServiceChange.req (BIWF_Registration) BIWF to CCU

Address information	**Control information**	**Bearer information**
Use New BIWF Control Address:	Transaction ID = z	
New BIWF Control Address	Context ID = Value not significant	
	Termination ID = Root	
	Service Change Reason = Cold Boot/Warm Boot	
	Service Change Method = Restart	
	Time Stamp = BIWF Time at sending	
	Service Change Version = Protocol Version	
	Non-Standard Data = Code	

Upon reception of the command in the CCU:

- The current CCU time is recorded together with the received Time Stamp from the BIWF.
- If Non-Standard Data is received, this is also stored and any provisioned default data for this type of BIWF is retrieved and stored for this BIWF.
- If a New BIWF Control Address was received, this is replacing the stored one after the subsequent response and is used for later communication with the BIWF.
- If the Service Change Reason is Cold boot the CCU clears all remaining calls in accordance with the release procedure in the call protocol.

A command response (2) is then returned with the following information:

- The same or a lower Protocol Version is returned dependent on whether the CCU supports the received Protocol Version or only a lower Protocol Version.
- Either the own CCU Control Address or a New CCU Control Address, if previously supplied by the CCU operator, is returned to be used by the BIWF for the further communication with the CCU.

The CCU can then regard the BIWF as Registered and the Service State of the BIWF as In Service.

Upon completion of processing command (1) a ServiceChange.resp command (2) is sent.

2 ServiceChange.resp **CCU to BIWF**

Address information	Control information	Bearer information
Use current CCU Control Address: CCU Control Address Use New CCU Control Address: New CCU Control Address	Transaction ID = z Context ID = Value not significant Termination ID = Root Service Change Version = (Lower) Protocol Version	

Upon reception of the command in the BIWF:

- If received, the BIWF stores the New CCU Control Address to be used by the BIWF for the further communication with the CCU.
- If received, the Protocol Version to use is also stored.

The BIWF can then regard the CCU as Registered and the Service State of the BIWF as In Service.

8.3.1.2 BIWF Re_Registration

When the transaction "*BIWF_Re-Registration*" is required the following procedure is initiated. "BIWF Re-Registration" cannot be sent spontaneously from the MG. The reregistration must be ordered from the CSF.

A ServiceChange.req command is sent with the following information.

1 ServiceChange.req (BIWF_Re_Registration) **BIWF to CCU**

Address information	Control information	Bearer information
Service Change Address = Own or New BIWF Control Address	Transaction ID = z Context ID = Value not significant Termination ID = Root Service Change Reason = MGC Directed Change Service Change Method = Handoff Time Stamp = BIWF Time at sending Service Change Version = Protocol Version Non-Standard Data = Code	

Upon reception of the command in the CCU:

- The current CCU time is recorded together with the received Time Stamp from the BIWF.
- If Non-Standard Data is received, this is also stored and any provisioned default data for this type of BIWF is retrieved and stored for this BIWF.
- If a New BIWF Control Address was received, this is replacing the stored one after the subsequent response and is used for later communication with the BIWF.

A command response (2) is then returned with the following information:

- The same or a lower Protocol Version is returned dependent on whether the CCU supports the received Protocol Version or only a lower Protocol Version.
- Either the own CCU Control Address or a New CCU Control Address, if previously supplied by the CCU operator, is returned for use by the BIWF for the further communication with the CCU.

The CCU can then regard the BIWF as Registered and the Service State of the BIWF as In Service.

Upon completion of processing command (1) a ServiceChange.resp command (2) is sent.

2 ServiceChange.resp **CCU to BIWF**

Address information	Control information	Bearer information
Service Change Address = Own or New CCU Control Address	Transaction ID = z Context ID = Value not significant Termination ID = Root Service Change Version = (Lower) Protocol Version	

Upon reception of the command in the BIWF:

- If received, the BIWF stores the CCU Control Address to be used by the BIWF for the further communication with the CCU.
- If received, the Protocol Version to use is also stored.

8.3.1.3 BIWF_Lost_Communication

When the transaction *"BIWF_Lost_Communication"* is required the following procedure is initiated.

A ServiceChange.req command is sent with the following information.

1 ServiceChange.req (BIWF_Lost_Communication) **BIWF to CCU**

Address information	Control information	Bearer information
	Transaction ID = z Context ID = Value not significant Termination ID = Root Service Change Reason = Service Restored Service Change Method = Disconnected Time Stamp: Time Stamp = BIWF Time at sending	

Upon reception of the command in the CCU:

- If received, the CCU stores the Time Stamp from the BIWF together with the current CCU time.
- A command response (2) is then sent using the stored BIWF Control Address.

Upon completion of processing command (1) a ServiceChange.resp command (2) is sent.

2 ServiceChange.resp **CCU to BIWF**

Address information	Control information	Bearer information
	Transaction ID = z Context ID = Value not significant Termination ID = Root	

8.3.1.4 BIWF_Service_Restoration_Indication

When the transaction "*BIWF_Service_Restoration_Indication*" is required the following procedure is initiated.

A ServiceChange.req command is sent with the following information.

1	ServiceChange.req (BIWF_Service_Restoration_Indication)	BIWF to CCU
Address information	**Control information**	**Bearer information**
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL Service Change Reason = Service Restored Service Change Method = Restart Delay: Service Change Delay = Delay	

Upon reception of the command in the CCU:

- A command response (2) is sent.

After the Delay, the CCU can regard the Service State of the Termination(s) or the BIWF as In Service.

Upon completion of processing command (1) a ServiceChange.resp command (2) is sent.

2	ServiceChange.resp	CCU to BIWF
Address information	**Control information**	**Bearer information**
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL	

Upon reception of the command in the BIWF:

After the Delay, the BIWF sets the Service State of the Termination(s) or the BIWF to In Service.

8.3.1.5 BIWF_Service_Cancellation_Indication

When the transaction "*BIWF_Service_Cancellation_Indication*" is required the following procedure is initiated.

A ServiceChange.req command is sent to all registered CCUs with the following information.

1	**ServiceChange.req (BIWF_Service_Cancellation_Indication)**	**BIWF to CCU**
Address information	**Control information**	**Bearer information**
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL Service Change Reason = For Terminations / BIWF: Termination Taken Out Of Service/ Transmission Failure/ Termination Malfunction/ Loss of Lower Layer Connectivity For a BIWF: MG Impending Failure Service Change Method = Graceful/Forced Delay: Service Change Delay = Delay	

Upon reception of the command in the CCU:

- A command response (2) is sent.
- The CCU refrains from establishing new connections to the Termination(s) or the BIWF and starts to tear down existing connections from the Termination(s) or the BIWF gracefully or by force, with or without a Delay, as requested.
- When no Delay is indicated for a graceful tear down, the CCU is to wait for the natural removal of the existing connections.

After the Delay, the CCU can regard the Service State of the Termination(s) or the whole BIWF as Out Of Service.

Upon completion of processing command (1) a ServiceChange.resp command (2) is sent.

2	**ServiceChange.resp**	**CCU to BIWF**
Address information	**Control information**	**Bearer information**
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL	

Upon reception of the command in the BIWF:

When the BIWF has received the last ServiceChange.resp and after the Delay, it sets the Service State of the Termination(s) or the whole BIWF to Out Of Service.

8.3.1.6 BIWF_Capability_Change

When the transaction "*BIWF_Capability_Change*" is required the following procedure is initiated.

A ServiceChange.req command is sent to all registered CCUs with the following information.

1 ServiceChange.req (BIWF_Capability_Change) BIWF to CCU

Address information	Control information	Bearer information
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL Service Change Method = Disconnected/Restart Service Change Reason = Modem/Mux/Media/ Event/Signal Capability Failure	

Upon reception of the command in the CCU:

- A command response (2) is sent.
- If Service Change Method Disconnected is received it indicates that resources are going out of service as a result of a capability change. If Restart is indicated, resources associated with the capability change are coming back into service.

The CCU may use the procedures "Audit_Value" and/or "Audit_Capabilities" as described in 8.2.2.1 and 8.2.2.2:

- If ServiceChange.req indicates Capability Failure (Modem/Events/Signals/Mux/Media) as Reason, an audit with respect to the current Packages may need to be performed.
- If ServiceChange.req indicates Capability Failure (Modem/Events/Signals/Mux/Media) as Reason where the indicated Descriptor includes Properties, an audit with respect to the current Packages and Properties (with Values) may need to be performed.
- If ServiceChange.req indicates Event Capability Failure as Reason, the Event Descriptor may need to be audited with respect to the current Events.
- If ServiceChange.req indicates Signal Capability Failure as Reason, the Signal Descriptor may need to be audited with respect to the current Signals.
- In all cases, the Digit Map Descriptor may need to be audited with respect to the current Digit Map (Values).

Upon completion of processing command (1) a ServiceChange.resp command (2) is sent.

2 ServiceChange.resp CCU to BIWF

Address information	Control information	Bearer information
	Transaction ID = z Context ID = Null/Context ID/ALL Termination ID = Termination(s)/Root/ALL	

9 CBC procedures – Outage and recovery

9.1 CSF transactions

The following transactions are used to indicate that a procedure is to be initiated by the CSF. These transactions lead to commands being sent across the CBC interface.

Table 6/Q.1950 – Transactions initiated from the CSF for Outage and Recovery

Transaction	Description
CCU Initiated Service Restoration	This transaction is used by the CSM to indicate that it has been restored to Service.
CCU Initiated Service Cancellation	This transaction is used by the CSM to indicate that it will be removed from Service.

9.1.1 CCU outage

The BIWF shall detect a CCU outages by the detection of a signalling failure or the reception of CCU ordered service cancellation.

9.1.1.1 CCU initiated service cancellation

If a CCU is removed from service it may initiate service cancellation procedures. See 8.2.1.3.

9.1.1.2 Signalling failure

As a result of the recovery action the CCU may loose contact with the BIWF. The BIWF shall detect the failure of the signalling association.

9.1.2 CCU Recovery

9.1.2.1 CCU initiated service restoration

After the CCU has recovered and the signalling association with the BIWF has been restored, the CCU starts a timer Tw. Tw is used to supervise the reception of any of the following recovery indications from the BIWF:

a) BIWF_Lost_Communication. See 8.3.1.3;

b) BIWF_Registration. See 8.3.1.1;

c) BIWF_Re-Registration. See 8.3.1.2;

d) BIWF_Service_Restoration_Indication. See 8.3.1.4.

If Tw expires the CCU Initiated Service Restoration (see 8.2.1.2) transaction will be invoked.

9.2 BIWF Transactions

This clause describes how a BIWF outage is detected and the recovery from the outage situation is carried out. The following transactions are the transactions used to indicate that a procedure is to be initiated in the BIWF. These transactions map to events generated by the BCF.

Table 7/Q.1950 – Transactions initiated from the CSF for outage and recovery

Transaction	Description
BIWF_Registration	This transaction is used by the BIWF to register with a CSM.
BIWF_Service_Cancellation_ Indication	This transaction is used by the BIWF to indicate to the CSM that Termination(s) on the BIWF or the BIWF are to be taken out of service.
BIWF_Service_Restoration_ Indication	This transaction is used by the BIWF to indicate to the CSM that Termination(s) on the BIWF or the BIWF are to be taken into service.

9.2.1 BIWF outage

The CCU will assume that the BIWF is out of service if:

a) it detects a failure in the signalling association; or

b) a BIWF Service cancellation indication (see 8.3.1.5) is received.

9.2.1.1 The BIWF indicates service cancellation

This failure indication indicates that the BIWF will go out of service and that no new connections should be established using this BIWF. In the forced method, all connections are cleared immediately.

9.2.1.2 A signalling outage

No communication with the BIWF is possible.

9.2.2 BIWF recovery

Depending on the severity of the outage of the BIWF, two possible procedures are possible.

9.2.2.1 BIWF service restoration

The BIWF indicates to all connected CCUs that normal operation has resumed.

9.2.2.2 BIWF registration

The procedure is used at start-up or a severe recovery action when e.g. the protocol version and transport addresses need to be exchanged. The BIWF will register with all the relevant CCUs using the BIWF Registration procedure.

10 Formats and codes

This clause outlines the encoding of the CBC protocol.

10.1 Formats and codes – General

The coding and format of the Call Bearer Control messages and commands is contained in Annex A/H.248.1 – "Binary encoding of the protocol" and Annex B/H.248.1 – "Text encoding of the protocol" [1]. A Call Bearer Control message may contain one or more transactions that may contain one or more actions. See 8.3/H.248.1.

The mandatory information that should be contained in every message is the megaco identifier "MEGACO", version "/1", the message sender's address e.g. "`[123.123.123.4]:55555`" and the transactionID e.g. "Transaction = 9999". The message sender can be an MG or MGC. Other fields are optional. See example below.

```
MEGACO/1 [123.123.123.4]:55555
Transaction = 9999 {
  Context = - {
    Modify = A4444 {
      Media { Stream = 1 {
            LocalControl {
              Mode = SendReceive
            },
            Local {
            }
          }
      },
      Events = 2222 {al/of}
    }
  }
}
```

Example 1 – Text encoding of H.248.1

Individual Signalling Objects shall be encoded according to the Tables in 10.3.

10.2 Formats and codes – Commands

The Commands indicated in clauses 6, 7 and 8 are encoded according to the following table.

Table 8/Q.1950 – CBC command to H.248.1 command mapping

CBC command	H.248.1 command
ADD.req	ADD 7.2.1/H.248.1 encoded according to command request in Annexes A or B/H.248.1.
ADD.resp	ADD 7.2.1/H.248.1 encoded according to command reply in Annexes A or B/H.248.1.
MOD.req	Modify 7.2.2/H.248.1 encoded according to command request in Annexes A or B/H.248.1.
MOD.resp	Modify 7.2.2/H.248.1 encoded according to command reply in Annexes A or B/H.248.1.
SUB.req	Subtract 7.2.3/H.248.1 encoded according to command request in Annexes A or B/H.248.1.
SUB.resp	Subtract 7.2.3/H.248.1 encoded according to command reply in Annexes A or B/H.248.1.
MOV.req	Move 7.2.4/H.248.1 encoded according to command request in Annexes A or B/H.248.1.
MOV.resp	Move 7.2.4/H.248.1 encoded according to command reply in Annexes A or B/H.248.1.
AuditValue.req	Audit Value 7.2.5/H.248.1 encoded according to command request in Annexes A or B/H.248.1.
AuditValue.resp	Audit Value 7.2.5/H.248.1 encoded according to command reply in Annexes A or B/H.248.1.
AuditCap.req	Audit Capabilities 7.2.6/H.248.1 encoded according to command request in Annexes A or B/H.248.1.
AuditCap.resp	Audit Capabilities 7.2.6/H.248.1 encoded according to command reply in Annexes A or B/H.248.1.
NOT.ind	Notify 7.2.7/H.248.1 encoded according to command request in Annexes A or B/H.248.1.

Table 8/Q.1950 – CBC command to H.248.1 command mapping

CBC command	H.248.1 command
NOT.resp	Notify 7.2.7/H.248.1 encoded according to command reply in Annexes A or B/H.248.1.
ServiceChange.req	Service Change 7.2.8/H.248.1 encoded according to command request in Annexes A or B/H.248.1.
ServiceChange.resp	Service Change 7.2.8/H.248.1 encoded according to command reply in Annexes A or B/H.248.1.

10.3 Formats and codes – Signalling objects

Table 9/Q.1950 – CBC signalling object to H.248.1 coding mapping table

<table>
<tr><th>CBC signalling object</th><th>H.248.1 descriptor</th><th colspan="2">H.248.1 coding</th></tr>
<tr><td>A-BNC Characteristics</td><td>NA</td><td colspan="2">Not encoded. This is implied by the BNC Characteristics applied to the other termination/s in the context.</td></tr>
<tr><td>Audit Descriptor</td><td>NA</td><td colspan="2">As per Annexes A or B/H.248.1.</td></tr>
<tr><td>BNC-cut-through-capability</td><td>LocalControl</td><td colspan="2">As defined in Package/Property in A.4.1.1.</td></tr>
<tr><td>BNC_Characteristics</td><td>LocalControl</td><td colspan="2">As defined in Package/Property in A.3.1.1.</td></tr>
<tr><td>BNC-id</td><td>Local/Remote Descriptor</td><td colspan="2">As defined in 5.7.4.</td></tr>
<tr><td rowspan="4">Bearer Service Characteristics</td><td rowspan="4">LocalDescriptor
RemoteDescriptor</td><td colspan="2">The Bearer Service Characteristic is a generic signalling object. The coding of the Bearer Service Characteristic element will depend on how these characteristics are described. See list below.</td></tr>
<tr><td>Bearer service characteristic type:</td><td>Relevant clause:</td></tr>
<tr><td>TMR</td><td>As defined in 5.7.1.</td></tr>
<tr><td>USI</td><td>As defined in 5.7.2.</td></tr>
<tr><td>BIWF-Address</td><td>Local/Remote Descriptor</td><td colspan="2">As defined in 5.7.5.</td></tr>
<tr><td>BIWF-Control-Address (new)</td><td>NA</td><td colspan="2">Signalling Transport Address of the underlying transport from the BIWF. "mID" as defined in Annexes A and/or B/H.248.1.</td></tr>
<tr><td>Cancel Echo = on/off</td><td>LocalControlDescriptor</td><td colspan="2">As defined in E.13/H.248.1 TDM Circuit Package property "Echo Cancellation".</td></tr>
<tr><td>CCU-Control-Address (new)</td><td>NA</td><td colspan="2">Signalling Transport Address of the underlying transport from the CCU. "mID" as defined in Annexes A and/or B/H.248.1.</td></tr>
<tr><td>Codec</td><td>LocalDescriptor
RemoteDescriptor</td><td colspan="2">As defined in 5.7.3.</td></tr>
</table>

Table 9/Q.1950 – CBC signalling object to H.248.1 coding mapping table

<table>
<tr><th>CBC signalling object</th><th>H.248.1 descriptor</th><th colspan="2">H.248.1 coding</th></tr>
<tr><td>Connection Configuration= (TerminationID= x1, TerminationID=x2, [TypeX]),…</td><td>Topology Descriptor</td><td colspan="2">As defined in Annexes A or B/H.248.1 [1]. For TopologyDescriptor see 7.1.18/H.248.1 [1].
Refer to ITU-T Q-series Supplement 7, TRQ.2001: General aspects for the development of unified signalling requirements [12] for definitions of call Types. In terms of H.248.1, one-way, both way and isolate will be used. x1 and x2 are the TerminationIDs on which the bearer is to be through connected. Two terminations may be specified in the commands.</td></tr>
<tr><td>Context ID</td><td>NA</td><td colspan="2">As per Annexes A or B/H.248.1.</td></tr>
<tr><td>Cut Through Direction = direction</td><td>Local Control</td><td colspan="2">As per streamMode in Local Control Descriptor in Annexes A or B/H.248.1.
Forward relates to Send Mode (sendOnly).
Backward relates to Receive Mode (recvOnly).
Both relates to send and receive (sendRecv).
Inactive relates to inactive Mode (inactive).</td></tr>
<tr><td rowspan="11">Event (Event ID = x, "y")</td><td rowspan="11">ObservedEvents Descriptor</td><td colspan="2">As per Annexes A or B/H.248.1.
The event ID is encoded as per Annexes A or B/H.248.1.
The format of the event y that was detected by the MG is defined in the Packages clause 5.9.</td></tr>
<tr><td>Where y is:</td><td>Relevant Package (clause):</td></tr>
<tr><td>Bearer Information Transport</td><td>A.7.2.1</td></tr>
<tr><td>BNC Established</td><td>A.6.2.1</td></tr>
<tr><td>BNC Modified</td><td>A.6.2.1</td></tr>
<tr><td>BNC Mod Failed</td><td>A.6.2.1</td></tr>
<tr><td>BNC Release</td><td>E.1.2/H.248.1 Cause Event.</td></tr>
<tr><td>Cut Through</td><td>A.6.2.1</td></tr>
<tr><td>Detect_Digit (Digit,Timing)</td><td>E.6/H.248.1 DTMF Detection Package.</td></tr>
<tr><td>Signal Completion</td><td>E.1.2/H.248.1 Signal Completion Event.</td></tr>
<tr><td>Logical Port ID</td><td>NA</td><td colspan="2">The Logical Port ID can be represented using a termination ID structure. The CSF can represent the Logical Port ID by wildcarding "?" a part of the termination ID structure.</td></tr>
<tr><td>Non-Standard Data</td><td>NA</td><td colspan="2">As per Annexes A or B/H.248.1 ServiceChangeParm → nonStandardData.</td></tr>
</table>

Table 9/Q.1950 – CBC signalling object to H.248.1 coding mapping table

<table>
<tr><th>CBC signalling object</th><th>H.248.1 descriptor</th><th colspan="2">H.248.1 coding</th></tr>
<tr><td rowspan="14">Notification Requested (Event ID = x,"y")</td><td rowspan="14">EventDescriptor</td><td colspan="2">As per Annexes A or B/H.248.1.
The event ID is encoded as per Annexes A or B/H.248.1.
The format of the event y to be detected by the MG is defined in the relevant Packages.</td></tr>
<tr><td>Where y is:</td><td>Relevant Package (clause):</td></tr>
<tr><td>All BNC Events</td><td>Events for BNC Connected, BNC Established, BNC Modified, BNC Mod Failed and BNC Release should be detected. Encoding as indicated below.</td></tr>
<tr><td>BNC Connected</td><td>Encoded as per "BNC Established" A.6.2.1.</td></tr>
<tr><td>BNC Established</td><td>A.6.2.1</td></tr>
<tr><td>BNC Modified</td><td>A.6.2.1</td></tr>
<tr><td>BNC Mod Failed</td><td>A.6.2.1</td></tr>
<tr><td>BNC Release</td><td>A.6.2.1</td></tr>
<tr><td>Cut Through</td><td>A.6.2.1</td></tr>
<tr><td>Detect_Digit (Digit,Timing)")</td><td>E.6/H.248.1 DTMF Detection Package.</td></tr>
<tr><td>Signal Completion</td><td>Annexes A and B/H.248.1 Notify Completion signal parameter on the Signal to be monitored is used to set the Signal Completion Event. The Signal Completion event must also be set on the required termination.
The event is notified as per E.1.2/H.248.1 Signal Completion Event.</td></tr>
<tr><td>Tunnel Indication</td><td>A.7.2.1</td></tr>
<tr><td>Release Cause</td><td>SignalDescriptor</td><td colspan="2">A.6.3.3</td></tr>
<tr><td>Reuse_IDLE_ Indication</td><td>Local Control</td><td colspan="2">A.5.1.1</td></tr>
<tr><td>Reserve_Value</td><td>Local Control</td><td colspan="2">7.1.7/H.248.1 [1] Mode property. Encoding as per Annex A/H.248.1 "reserveValue" or Annex B/H.248.1 "reservedValueMode".</td></tr>
<tr><td>Reset</td><td>SignalDescriptor</td><td colspan="2">A.6.3.3</td></tr>
<tr><td>Service Change Address</td><td>NA</td><td colspan="2">As per Annexes A or B/H.248.1 serviceChangeAddress.</td></tr>
<tr><td>Service Change Delay</td><td>NA</td><td colspan="2">As per Annexes A or B/H.248.1 serviceChangeDelay.</td></tr>
<tr><td>Service Change Method</td><td>NA</td><td colspan="2">As per Annexes A or B/H.248.1 serviceChangeMethod.</td></tr>
</table>

Table 9/Q.1950 – CBC signalling object to H.248.1 coding mapping table

<table>
<tr><th>CBC signalling object</th><th>H.248.1 descriptor</th><th colspan="2">H.248.1 coding</th></tr>
<tr><td>Service Change MGC ID</td><td>NA</td><td colspan="2">As per Annexes A or B/H.248.1 serviceChangeMgcId.</td></tr>
<tr><td>Service Change Reason</td><td>NA</td><td colspan="2">As per Annexes A or B/H.248.1 serviceChangeReason.</td></tr>
<tr><td>Service Change Version</td><td>NA</td><td colspan="2">As per Annexes A or B/H.248.1 serviceChangeVersion.</td></tr>
<tr><td>Service State</td><td>Termination State Descriptor</td><td colspan="2">As per Annexes A or B/H.248.1 TerminationStateDescriptor → serviceState.</td></tr>
<tr><td rowspan="4">Signal Direction</td><td rowspan="4">SignalDescriptor</td><td colspan="2">The encoding of the SignalDirection depends on the signal to be played.</td></tr>
<tr><td>Signal to be Played:</td><td>Encoding defined in Package (clause):</td></tr>
<tr><td>Announcement ID</td><td>See H.248.7 Generic Announcement Package.</td></tr>
<tr><td>ToneID</td><td>See clauses A.8 to A.13.</td></tr>
<tr><td>SignalTiming</td><td>SignalDescriptor</td><td colspan="2">Signal Timing has three possible definitions: Start, Stop, Duration and number of cycles.
Start/Stop and Timeout are defined in 7.1.11/H.248.1 (on/off, timeout) and are encoded as per Annex A/H.248.1 "sigType" or Annex B/H.248.1 "signalType". Duration is encoding as per Annex A/H.248.1 "duration" or Annex B/H.248.1"sigDuration".
Number of Cycles is used for playing announcements and is defined in H.248.7.</td></tr>
<tr><td rowspan="9">Signal = x</td><td rowspan="9">SignalDescriptor</td><td colspan="2">As per Annexes A or B/H.248.1. The format of the signal x to be detected by the MG is defined in the relevant Packages.</td></tr>
<tr><td>Where x is:</td><td>Relevant Package (clause):</td></tr>
<tr><td>Announcement ID</td><td>H.248.7 Generic Announcement Package.</td></tr>
<tr><td>Bearer Information Transport</td><td>A.7.3.1</td></tr>
<tr><td>BNC Establish</td><td>A.6.3.1</td></tr>
<tr><td>BNC Modify</td><td>A.6.3.2</td></tr>
<tr><td>BNC Release</td><td>A.6.3.3</td></tr>
<tr><td>Digit/s</td><td>E.5/H.248.1 Basic DTMF Generator Package.</td></tr>
<tr><td>ToneID</td><td>See clauses A.8 to A.13.</td></tr>
<tr><td>Streammode</td><td>Local Control</td><td colspan="2">As per Annexes A or B/H.248.1.</td></tr>
<tr><td>Termination ID = bearer x</td><td>NA</td><td colspan="2">As per Annexes A or B/H.248.1. The structure of the TerminationID is defined as in 5.2.2. "Bearer x" is a representation of the Termination ID that relates to a particular bearer, it is not the BNC-ID.</td></tr>
</table>

Table 9/Q.1950 – CBC signalling object to H.248.1 coding mapping table

CBC signalling object	H.248.1 descriptor	H.248.1 coding
Time Stamp	NA	As per Annexes A or B/H.248.1 serviceChangeParm → timestamp.
Transaction ID	NA	As per Annexes A or B/H.248.1.

10.4 Example protocol encoding

This clause provides an example encoding of a CBC message.

10.4.1 Method

The relevant transaction to be encoded is selected. The appropriate command and signalling objects relating to the primitive are then selected from clauses 7 and 8. These signalling objects are then encoded according to clause 10.

10.4.2 Examples

10.4.2.1 Prepare_BNC_notify example

The transaction "Prepare_BNC_notify" is selected. Clause 7.1.1 outlines the relevant signalling objects and in this case the ADD.req command is used. In these examples, the MG has the IP address 124.124.124.222, and the MGC IP address is 123.123.123.4. The default MEGACO port is 55555. The value "$" is a wild card indicating that the MG can choose any value when it receives the Add.req from the MGC. According to clauses 10.1 and 10.3, an example of the H.248.1 message structure is encoded as follows:

NOTE – In the examples below "- – -" on the m= line is not carried. Characters according to SDP shall be carried instead.

```
MEGACO/1 [123.123.123.4]:55555
Transaction = z {
  Context = $ {    Add = $ {
      Media {
       Stream = 1 {
                 LocalControl {
                        BCP/BNCChar = Aal2
                   },
                 Local
                        {
                             v=0
                             c=ATM NSAP $
                             m=audio - - -
                             a=eecid: $
                   },
                 Remote {
                             v=0
                             c=ATM - -
                             m=audio - - -
                        },
                 Events = 1111 {GB/BNCChange,
                             G/cause}
          }
       }
     }
}
```

The response is encoded as follows:

```
MEGACO/1 [124.124.124.222]:55555
Reply = z {
  Context = x {
      Add = bearer1 {
      Media  {
       Stream = 1 {
          Local {
                    v=0
                    c=ATM NSAP FF FF FF FF
                    m=audio - - -
                    a=eecid: EF 23 12 13
                  }
              }
                  }
          }
     }
}
```

10.4.2.2 Establish_BNC_notify example

The transaction "Establish_BNC_notify" is selected. Clause 7.1.2 outlines the relevant signalling objects and in this case the MOD.req command is used. In this case, the termination and context is provided and tunnelling can be used. According to clauses 10.1 and 10.3, an example of the message structure is as follows:

```
MEGACO/1 [123.123.123.4]:55555
Transaction = z {
  Context = c1 {
     Modify = bearer1 {
      Media {
       Stream = 1 {
          LocalControl{
                        BCP/BNCChar = AAL2
                        BT/TunOpt = 2
               }
          Local{
                        v=0
                        c=ATM - -
                        a=vsel:G711 - - -
               },
          Remote {
              v=0
                        c=ATM NSAP FF FF FF FF,
                        a=eecid: EF 23 12 13
                        a=vsel:G711 - - -
              },
          Events = 1111 {
                        GP/BNCChange,
                        BT/TIND},
          Signals  {GB/EstBNC
                              {
                                   SignalType = Brief,
                                        }        }
        }
      }
   }
}
```

The response is encoded as follows:

```
MEGACO/1 [124.124.124.222]:55555
Reply = z {
          Context = c1 {
                Modify = bearer1
              }
           }
```

Annex A

Q.1950 packages

A.1 Introduction

This annex contains packages that have been defined for use with BICC networks. The packages contained in this annex can be used in other types of networks e.g. Mobile networks, SIP networks. The packages have been defined in a generic way to enable reuse of functions that they represent.

The packages contained are:

- Bearer Characteristics Package, A.3;
- Bearer Network Connection Cut Through Package, A.4;
- Reuse Idle Package, A.5;
- Generic Bearer Connection Package, A.6;
- Bearer Control Tunnelling Package, A.7;
- Basic Call Progress Tones Generator with Directionality, A.8;
- Expanded Call Progress tones Generator Package, A.9;
- Basic Services Tones Generation Package, A.10;
- Expanded Services Tones Generation Package, A.11;
- Intrusion Tones Generation Package, A.12;
- Business Tones Generation Package, A.13.

A.2 References

A.2.1 Normative

– ITU-T Recommendation E.182 (1998), *Application of tones and recorded announcements in telephone services*.

– ITU-T Recommendation H.248.1 (2002), *Gateway Control Protocol: Version 2*.

– ITU-T Recommendation Q.1990 (2001), *BICC Bearer Control Tunnelling Protocol*.

A.2.2 Informative

–

A.2.3 Bibliography

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A.3 Bearer characteristics package

Package Name: BCP
Package ID: 0x001e
Description: This package contains the functionality required to identify which bearer services are to be supported by a MG.
Version: 2
Extends: None

A.3.1 Properties

A.3.1.1 BNC Characteristics

Property Name: BNC Characteristics
PropertyID: 0x01, BNCChar
Description: Defines the characteristics of the bearer network connection.
Type: Enumeration
Possible Values: The following table is based on the BNC Characteristics values and encodings defined in 11.1.9/Q.765.5.

BNC Characteristics value	Q.765.5 binary encoding	Text encoding
AAL type 1	0x0001	Aal1
AAL type 2	0x0002	Aal2
Structured AAL 1	0x0003	aal1_struct
IP/RTP	0x0004	IP/RTP
TDM	0x0005	TDM
00000110 to 11111111	0x0006 to 0x00FF	BC6 To BC255

The binary version is encoded as per 11.1.9/Q.765.5.

Defined in: Local Control
Characteristics: Read & Write

A.3.2 Events

NA.

A.3.3 Signals

NA.

A.3.4 Statistics

NA.

A.3.5 Procedures

The BNCChar property indicates to the MG the preferred Bearer Characteristics (e.g. IP, AAL 2, AAL 1). This is a generic property and can be used with various Call Controls. For its use in BICC Networks see clauses 7, 8 and 9.

For the textual encoding of Q.1950 the BNCChar value shall be mapped to the <NetworkType> portion of the "c=" line according to the following:

BNC characteristics value	<NetworkType>
AAL type 1	ATM
AAL 2 type 2	ATM
Structured AAL 1	ATM
IP/RTP	IN
TDM	TDM

In BICC networks the <AddressType> and <Address> portion shall be encoded according to 5.7.5.2 BIWF Address. If no BIWF Address is assigned or requested then <AddressType> and <Address> shall be encoded "-" and "-".

A.4 Bearer network connection cut-through package

Package Name: BNCT
Package ID: 0x001f
Description: This package provides the functionality to be able to determine the cut through capabilities of the bearer network.
Version: 1
Extends: None

A.4.1 Properties

A.4.1.1 Bearer network connection cut-through capability

Property Name: BNC Cut Through Capability
PropertyID: 0x0001, BNCCT
Description: This property allows the MGC to ask the MG when the cut through of a bearer will occur, early or late.
Type: Enum
Possible Values: Early [0x01], Late [0x02]
Defined in: Local Control
Characteristics: Read & Write

A.4.2 Events

NA.

A.4.3 Signals

NA.

A.4.4 Statistics

NA.

A.4.5 Procedures

The MGC can ask the MG as to when the cut through of a particular bearer will occur, through the use of the BNCCT property. The MG can indicate whether the cut through will occur "early" or "late". Early relates to the bearer cutting-through on the establishment. Late refers to cutting-through on the confirmation. The BNCCT property in this package does not actually order the cut-through nor does it indicate when the Cut-through has occurred.

This property is generic and can be used by different Call Control protocols. For the use of BNCCT in BICC networks see clauses 7, 8 and 9.

A.5 Reuse idle package

Package Name: RI
Package ID: 0x0020
Description: This package provides the ablity to determine the reuse of idle bearer functionality network.
Version: 1
Extends: None

A.5.1 Properties

A.5.1.1 Reuse idle indication

Property Name: Reuse Idle Indication
PropertyID: 0x0001, RII
Description: This property indicates that the provided bearer network connection relates to an Idle Bearer.
Type: Boolean
Possible Values: Not_Reuse_Idle [0x00], ReUse_Idle [0x01]
Default: Not_Reuse_Idle [0x00]
Defined in: Local Control
Characteristics: Read & Write

A.5.2 Events

NA.

A.5.3 Signals

NA.

A.5.4 Statistics

NA.

A.5.5 Procedures

The RII property is used by the MG to indicate to the MGC that an idle bearer is to be reused instead of establishing a new bearer connection. On request from the MGC to establish a bearer, the MG will reply with an indication to reuse an idle and will provide a Bearer Network Connection Identity (i.e. BNC-ID encoded as either BIR or EECID) identifying the idle bearer. The MGC will then use this information as appropriate.

RII is a generic property and is applicable for various Call Controls. For the use of RII in BICC Networks see clauses 7, 8 and 9.

A.6 Generic bearer connection package

Package Name: GB
Package ID: 0x0021
Description: This package provides the functionality to be able to establish/modify/release a bearer connection.
Version: 1
Extends: None

A.6.1 Properties

NA.

A.6.2 Events

A.6.2.1 BNC change

Event name: BNCChange
EventID: 0x01
Description: This event occurs whenever a change to a Bearer Network connection occurs. For example a bearer has been established or a bearer has been modified.
EventsDescriptor Parameters:

Parameter Name: Type
ParameterID: 0x01
Type: Enumeration
Possible values:

Est, [0x01] Bearer Established
Mod, [0x02] Bearer Modified
Cut, [0x03] Bearer Cut through
Mfail, [0x04] Bearer Modification Failure

NOTE 1 – For release indication see: General Package E.1.2/H.248.1 Cause Event.

Description: This is used to request the MG to notify it of a particular bearer event.

ObservedEventsDescriptor Parameters:

Parameter Name: Type
ParameterID: 0x01
Type: Enumeration
Possible values:

Est, [0x01] Bearer Established
Mod, [0x02] Bearer Modified
Cut, [0x03] Bearer Cut through
Mfail, [0x04] Bearer Modification Failure

NOTE 2 – For release indication, see General Package E.1.2/H.248.1 Cause Event.

Description: This is used to indicate what change has occurred to the BNC.

A.6.3 Signals

A.6.3.1 Establish BNC

Signal Name: Establish BNC
SignalID: 0x01, EstBNC
Description: This signal triggers the bearer control function to send bearer establishment signalling.
SignalType: BR (Brief)
Duration: NA
Additional Parameters: NA

A.6.3.2 Modify BNC

Signal Name: Modify BNC
SignalID: 0x02, ModBNC
Description: This signal triggers the bearer control function to send bearer modification.
SignalType: BR (Brief)
Duration: NA
Additional Parameters: NA

A.6.3.3 Release BNC

Signal Name: Release BNC
SignalID: 0x03, RelBNC
Description: This signal triggers the bearer control function to send bearer release.
SignalType: BR (Brief)
Duration: NA
Additional Parameters:

Parameter Name: General Cause
ParameterID: 0x01, Generalcause
Type: Enumeration
Possible Values:

"NR" Normal Release (0x0001)
"UR" Unavailable Resources (0x0002)
"FT" Failure, Temporary (0x0003)
"FP" Failure, Permanent (0x0004)
"IW" Interworking Error (0x0005)
"UN" Unsupported (0x0006)

Description: This indicates the general reason for the Release. It is optional to send this parameter in the normal case.
Parameter Name: Failure Cause
ParameterID: 0x02, Failurecause
Type: OCTET STRING
Possible Values:

Description: The Release Cause is the value generated by the Released equipment, i.e. a release network connection. The concerned value is defined in the appropriate call control protocol.

Parameter Name: Reset
ParameterID: 0x03, Reset
Type: Boolean
Possible Values:

0 Indicates that the bearer release was not generated by a call level reset. (Default)

1 Indicates that a reset was generated on the call level. The MG must clear any resource associated with the bearer by sending bearer release signalling.

Description: This parameter indicates whether or not the bearer should be reset.

A.6.4 Statistics

NA.

A.6.5 Procedures

For the EstablishBNC signal, the Bearer Control Address (i.e. BIWF address) and bearer connection identity (i.e. BNC-ID encoded as either BIR or EECID), bearer service characteristics or codec and bearer characteristics are needed to perform the setup of the bearer connection. To establish a connection the MGC shall use the EstablishBNC signal and if provided place the Bearer Control Address and Bearer Connection Identity in the Remote descriptor. The MG shall use the instances of these found in the Remote descriptor for any bearer control signalling.

Once the Bearer Control Address and the Bearer Connection Identity is set in the Remote descriptor and is used for the EstablishBNC signal and subsequent signals (e.g. Modify, Release).

The ModifyBNC signal is used to initiate Bearer Modification signalling to change the characteristics of a bearer (e.g. Bandwidth).

The ReleaseBNC signal is used to initiate Bearer Release signalling. The MGC may optionally include a GeneralCause, FailureCause or Reset indication. If a MG receives the reset indication it shall release all resources associated with the bearer.

The signals in this package are generic and can be used with various Call Controls. For the use of the above properties and signals in BICC networks see clauses 7, 8 and 9. For the encoding of the Bearer Control Address (e.g. BIWF Address) and Bearer Connection Identity (e.g. BNC-ID) in BICC networks the text and binary encodings are as specified in 6.7.

The Cut Through notification is generated when the requested bearer establishment procedures are complete.

A.7 Bearer control tunnelling package

Package Name: BT
PackageID: 0x0022
Description: This package describes the functionality to be able to support the transport of "Bearer Information Transport" information between an MGC and MG.
Version: 1
Extends: None

A.7.1 Properties

A.7.1.1 Tunnelling Option

Property Name: Tunnelling Options
PropertyID: 0x01, TunOpt
Description: This property is set to indicate when the MG shall send the tunnelled data information (BIT) to an MGC.
Type: Enumeration
Possible values:

1, [0x01]	In the same message as the command response to the command which generated the bearer control tunnel.
2, [0x02]	Tunnel message at any time
NO, [0x03]	No tunnel is used

Defined in: Local Control
Characteristics: Read & Write

A.7.2 Events

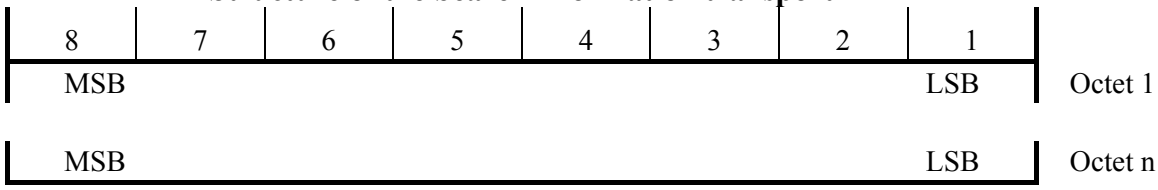
A.7.2.1 Tunnel indication

Event name: Tunnel Indication
EventID: 0x01, TIND
Description: This event occurs whenever tunnelled data is sent from a MG. The Bearer Information Transport is used to pass bearer control signalling information transparently between peer MGs.
EventsDescriptor Parameters: None
ObservedEventsDescriptor Parameters:

Parameter Name: Bearer Information Transport
ParameterID: 0x01, BIT
Type: Octet String
Description: This parameter contains bearer control signalling information. Any type of bearer control signalling information can be sent.
Possible values:

Binary encoding:

Structure of the bearer information transport



NOTE – Octet 1 contains the most significant octet of data.

Text encoding:

In case the data to be transported is a text format protocol (i.e. PDUs always consists of octets which have a standard textual representation under UTF-8), the "quotedString" alternative for the parameter value shall be used (i.e. the text of the tunnelled data shall be included within quotation marks).

In case the data to be transported is in a binary format, the data shall be encoded as a string of hexadecimal characters, each representing 4 bits of the tunnelled data. The left most hex digit pair (i.e. EF in the following sequence EF 23 12 13) represents the first octet that would be transmitted for the bearer protocol.

The determination of text/binary is on a per protocol basis. The encoding into quotedString or hexadecimal format is local to the H.248.1 protocol and is reversed before passing the data to other entities.

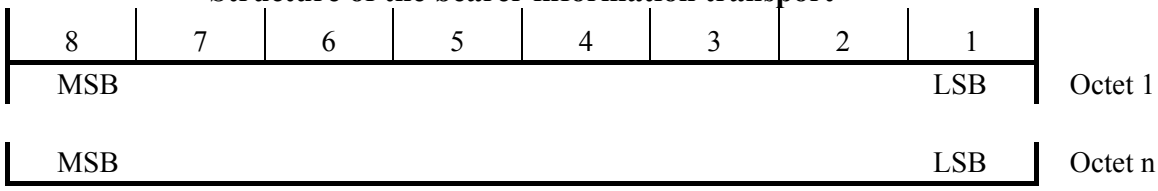
A.7.3 Signals

A.7.3.1 Bearer Information Transport

Signal Name: Bearer Information Transport
SignalID: 0x01, BIT
Description: A BIT signal is sent to a MG if the MGC receives tunneled bearer control signalling from a peer MGC has sent tunnelled bearer control signalling, such as bearer establishment signalling.
SignalType: BR (Brief)
Duration: NA
Additional Parameters:

Parameter Name: Bearer Information Tunnel
ParameterID: 0x01, BIT
Type: Octet String
Description: This property is used to pass bearer control signalling information transparently between peer MGs. The MGC shall not process the information in the tunnel.
Possible Values:
Binary Encoding:

Structure of the bearer information transport



NOTE – Octet 1 contains the most significant octet of data.

Text encoding:

In case the data to be transported is a text format protocol (i.e. PDUs always consists of octets which have a standard textual representation under UTF-8), the "quotedString" alternative for the

parameter value shall be used (i.e. the text of the tunnelled data shall be included within quotation marks).

In case the data to be transported is a binary format protocol, the data shall be encoded as a string of hexadecimal characters, each representing 4 bits of the tunnelled data. The left most hex digit pair (i.e. EF in the following sequence EF 23 12 13) represents the first octet that would be transmitted for the bearer protocol.

The determination of text/binary protocol is on a per protocol basis. The encoding into quotedString or hexadecimal format is local to the H.248.1 protocol and is reversed before passing the data to other entities.

A.7.4 Statistics

NA.

A.7.5 Procedures

This package is used to transparently carry bearer control signalling across a H.248.1 based interface. The MGC can request that the MG use this method by requesting the TIND event. The MG can then initiate the event at the appropriate time. The MGC can also request at which time it would like to be notified using a Tunnel i.e. at any time (option 2), in the same message as the command response (option 1). It may also question (?) the MG to see if tunnelling can be used.

The MGC can also send tunnelled bearer control information to the MG that it has received in the Call Control by sending the BIT signal.

Any type of bearer control signalling information can be sent in the tunnel. For the format of the information sent in BICC networks see ITU-T Rec. Q.1990.

The MGC before sending the tunnelled information across a text encoded H.248.1 interface to the MG shall check the tunnelled data format. If it indicates "text" then the MGC shall encode according to the Bearer Control protocol encoding format that it received. If it indicates "binary" then it shall encode the tunnelled information in a Hexadecimal format as specified by Annex B/H.248.1.

This is a generic package that can be used by various Call Controls. For its use in BICC networks see clauses 7, 8 and 9.

A.8 Basic call progress tones generator with directionality

Package Name: bcg
PackageID: 0x0023
Description: This package defines the basic call progress tones as signals and extends the allowed values of the tl parameter of playtone in tonegen. In addition, this package extends the Tone Generator Package with the ability to specify in which direction the tone is played.
Version: 1
Extends: tonegen version 1

A.8.1 Properties

None.

A.8.2 Events

None.

A.8.3 Signals

A.8.3.1 Dial Tone

Signal Name: Dial Tone
SignalID: bdt (0x0040)

Description: Generate dial tone. The physical characteristic of dial tone is available in the gateway.

Signal Type: Timeout

Duration: Provisioned

Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

Additional Values:

bdt (0x0040) is defined as a tone id for playtone

The other tones of this package are defined in exactly the same way. A table with all signal names and signal IDs is included. Note that each tone is defined as both a signal and a toneid, thus extending the basic tone generation package.

Signal Name	Signal ID/tone id
Dial Tone	bdt (0x0040)
Ringing tone	brt (0x0041)
Busy tone	bbt (0x0042)
Congestion tone	bct (0x0043)
Special information tone	bsit (0x0044)
Warning tone	bwt (0x0045)
Payphone recognition tone	bpt (0x0046)
Call waiting tone	bcw (0x0047)
Caller waiting tone	bcr (0x0048)
Pay tone	bpy (0x0049)

A.8.4 Statistics

None.

A.8.5 Procedures

NOTE – The required set of tone ids is as defined in ITU-T Rec. E.182 (3/1998). See ITU-T Rec. E.182 for definition of the meanings of these tones.

The direction parameter can be used to indicate the direction that the tone is to be sent. External (default) indicates that the tone is sent from the MG to an external point. Internal indicates that the tone is played into the Context to the other terminations. Both way indicates both internal and external behaviour.

A.9 Expanded call progress tones generator package

Package Name: xcg
PackageID: 0x0024
Description: This package defines additional call progress indications as signals and allows for specification of directionality.
Version: 1
Extends: tonegen version 1

A.9.1 Properties

None.

A.9.2 Events

None.

A.9.3 Signals

A.9.3.1 Comfort tone

Signal Name: Comfort Tone
SignalID: cmft (0x004a)
Description: Generate comfort tone, also known as routing tone, to indicate that the call is still in the process of being connected. Comfort tone corresponds to "comfort tone" as defined in ITU-T Rec. E.182. The physical characteristic of comfort tone is available in the gateway.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.9.3.2 Off-hook warning tone

Signal Name: Off-Hook Warning Tone
SignalID: roh (0x04b)
Description: Generate receiver off-hook warning tone, to urge the customer to replace the receiver on the cradle. The Off-Hook Warning tone signal is defined as per national variants. The physical characteristic of Off-Hook Warning tone is available in the gateway.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.9.3.3 Negative Acknowledgement

Signal Name: Negative Acknowledgement
SignalID: nack (0x04c)
Description: Signal negative acknowledgement, indicating that the action was unsuccessful. The Negative acknowledgement tone corresponds to "negative indication tone" as defined in ITU-T Rec. E.182. The physical characteristic of negative acknowledgement tone is available in the gateway.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.9.3.4 Vacant number tone

Signal Name: Vacant Number Tone
SignalID: vac (0x04d)
Description: Signal that the number dialled routes to a non-existent address. The physical characteristic of vacant tone is available in the gateway. Vacant tone, also known as number unobtainable tone, is defined in various national specifications.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.9.3.5 Special conditions dial tone

Signal Name: Special Conditions Dial Tone
SignalID: spec (0x04e)
Description: Signal that the originator's line has a condition preventing terminations (such as universal call forwarding). Special conditions dial tone corresponds to "special dial tone" as defined in ITU-T Rec. E.182. The physical characteristic of special conditions dial tone is available in the gateway.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.9.4 Statistics

None.

A.9.5 Procedures

None.

A.10 Basic services tones generation package

Package Name: srvtn
PackageID: 0x0025
Description: This package defines signals for use by telephony services and allows for specification of directionality.
Version: 1
Extends: tonegen version 1

A.10.1 Properties

None.

A.10.2 Events

None.

A.10.3 Signals

A.10.3.1 Recall dial tone

Signal Name: Recall Dial Tone
SignalID: rdt (0x004f)
Description: Generate recall dial tone, indicating that the switch is ready to accept additional information. Recall dial tone corresponds to "second dial tone" as defined in ITU-T Rec. E.182. The physical characteristic of recall dial tone is available in the gateway. There are various national mappings of this signal.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.10.3.2 Confirmation tone

Signal Name: Confirmation Tone
SignalID: conf (0x050)
Description: Generate confirmation tone, indicating that the previous action was successful. Confirmation tone corresponds to "positive indication tone" as defined in ITU-T Rec. E.182. The physical characteristic of confirmation tone is available in the gateway. There are various national mappings of this signal.
Signal Type: Brief
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)

Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.10.3.3 Held tone

Signal Name: Held Tone
SignalID: ht (0x051)
Description: Generate held tone, indicating that the remote end has the call in a held state. Held tone corresponds to "tone on hold" as defined in ITU-T Rec. E.182. The physical characteristic of held tone is available in the gateway.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:
Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.10.3.4 Message Waiting Tone

Signal Name: Message Waiting Tone
SignalID: mwt (0x052)
Description: Generate message waiting tone, indicating that a message is waiting for the user on a remote voice messaging system. The physical characteristic of message waiting tone is available in the gateway. There are various national mappings of this signal.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:
Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.10.4 Statistics

None.

A.10.5 Procedures

None.

A.11 Expanded services tones generation package

Package Name: xsrvtn
PackageID: 0x0026
Description: This package defines additional signals for use by telephony services and allows for specification of directionality.

Version: 1
Extends: tonegen version 1

A.11.1 Properties

None.

A.11.2 Events

None.

A.11.3 Signals

A.11.3.1 Call transfer dial tone

Signal Name: Call Transfer Dial Tone
SignalID: xferdt (0x053)
Description: Generate call transfer dial tone, indicating readiness to receive the transfer address information. This tone and its use are defined as per national specifications. The physical characteristic of call transfer dial tone is available in the gateway.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.11.3.2 Call forward tone

Signal Name: Call Forward Tone
SignalID: cft (0x054)
Description: Generate call forward tone, which is also commonly known as call diversion tone, indicating that the call is being forwarded to another destination. Call forward tone corresponds to "special ringing tone" as defined in ITU-T Rec. E.182. The physical characteristic of call forward tone is available in the gateway.
Signal Type: Brief
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.11.3.3 Credit card service tone

Signal Name: Credit Card Service Tone
SignalID: ccst (0x055)
Description: Generate credit card service tone, which is also commonly known as calling card service tone, indicating that the switch has accepted the credit card/calling card, and is ready to receive address information. This tone and its use are defined as per national specifications. The physical characteristic of credit card service tone is available in the gateway.

Signal Type: Brief
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.11.3.4 Special recall dial tone

Signal Name: Special Recall Dial Tone
SignalID: srdt (0x056)
Description: Generate special recall dial tone, used in the enquiry feature to indicate that a call is currently on hold. This tone and its use are defined as per national specifications. The physical characteristic of special recall dial tone is available in the gateway.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.11.4 Statistics

None.

A.11.5 Procedures

None.

A.12 Intrusion Tones Generation Package

Package Name: int
PackageID: 0x0027
Description: This package defines for use by operator-based telephony services and allows for specification of directionality.
Version: 1
Extends: tonegen version 1

A.12.1 Properties

None.

A.12.2 Events

None.

A.12.3 Signals

A.12.3.1 Intrusion Pending Tone

Signal Name: Intrusion Pending Tone
SignalID: pend (0x057)
Description: Generate intrusion pending tone, commonly known as cut-in tone, indicating a third party is intending to break into the call. This tone and its use are defined as per national specifications. The physical characteristic of intrusion pending tone is available in the gateway.
Signal Type: Brief
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.12.3.2 Intrusion tone

Signal Name: Intrusion Tone
SignalID: int (0x058)
Description: Generate intrusion tone, which is also commonly known as barge-in tone, or operator intervening tone, indicating a third party is breaking into the call. Intrusion tone corresponds to "Intrusion tone" as defined in ITU-T Rec. E.182. The physical characteristic of intrusion tone is available in the gateway.
Signal Type: Brief
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.12.3.3 Intrusion Reminder Tone

Signal Name: Intrusion Reminder Tone
SignalID: rem (0x059)
Description: Generate intrusion reminder tone, which is also known as attendant camp-on tone, indicating a third party remains broken into the call. This tone and its use are defined as per national specifications. The physical characteristic of intrusion reminder tone is available in the gateway.
Signal Type: Brief
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum

Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.12.3.4 Toll Break-In Tone

Signal Name: Toll Break-In Tone
SignalID: tbi (0x05a)
Description: Generate toll break-in tone, indicating a third party is breaking into a toll call. This tone and its use are defined as per national specifications. The physical characteristic of toll break-in tone is available in the gateway.
Signal Type: Brief
Duration: Provisioned, Not Auditable
Additional Parameters:
Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.12.3.5 Intrusion queue tone

Signal Name: Intrusion Queue Tone
SignalID: intque (0x05b)
Description: Generate intrusion queue tone, which is also commonly known as trunk queue tone, indicating a line is already under observation by another operator. This tone and its use are defined as per national specifications. The physical characteristic of intrusion queue tone is available in the gateway.
Signal Type: Brief
Duration: Provisioned, Not Auditable
Additional Parameters:
Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.12.3.6 Busy verification tone

Signal Name: Busy VerificationTone
SignalID: bv (0x05c)
Description: Generate busy verification tone, also known as busy operator tone, indicating to an operator that a line is engaged in an active call. This tone and its use are defined as per national specifications. The physical characteristic of intrusion queue tone is available in the gateway.
Signal Type: Brief
Duration: Provisioned, Not Auditable
Additional Parameters:
Tone Direction
ParameterID: btd (0x0001)
Type: enum

Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.12.4 Statistics

None.

A.12.5 Procedures

None.

A.13 Business tones generation package

Package Name: biztn
PackageID: 0x0028
Description: This package defines for use by business telephony services and allows for specification of directionality.
Version: 1
Extends: tonegen version 1

A.13.1 Properties

None.

A.13.2 Events

None.

A.13.3 Signals

A.13.3.1 Off-hook queuing tone

Signal Name: Off-Hook Queuing Tone
SignalID: ofque (0x05d)
Description: Generate off-hook queuing tone, indicating that the call is awaiting network resources. This tone and its use are defined as per national specifications. The physical characteristic of off-hook queuing tone is available in the gateway.
Signal Type: Brief
Duration: Provisioned, Not Auditable
Additional Parameters:
Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.13.3.2 Expensive route warning tone

Signal Name: Expensive Route Warning Tone
SignalID: erwt (0x05e)
Description: Generate expensive route warning tone, indicating that the call has been routed over a route that has a higher cost than a datafilled threshold. This tone and its use are defined as per national specifications. The physical characteristic of expensive route warning tone is available in the gateway.

Signal Type: Brief
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.13.3.3 Distinctive dial tone

Signal Name: Distinctive Dial Tone
SignalID: ddt (0x05f)
Description: Generate distinctive dial tone, indicating that the subscriber is dialing internally to the business group. After dialing the public access code, distinctive dial tone is usually replaced by standard dial tone. This tone and its use are defined as per national specifications. The physical characteristic of distinctive dial tone is available in the gateway.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.13.3.4 Internal Dial Tone

Signal Name: Internal Dial Tone
SignalID: idt (0x060)
Description: Generate internal dial tone, indicating that the subscriber is dialing on a PBX. Internal dial tone corresponds to "PABX internal dial tone" as defined in ITU-T Rec. E.182. The physical characteristic of distinctive dial tone is available in the gateway.
Signal Type: Timeout
Duration: Provisioned, Not Auditable
Additional Parameters:

Tone Direction
ParameterID: btd (0x0001)
Type: enum
Values: External ext (0x01),
Internal int (0x02),
Both both (0x03)
Default: ext

A.13.4 Statistics

None.

A.13.5 Procedures

None.

Annex B

Call bearer control – Continuity test

B.1 Introduction

This annex describes the enhancements to the Q.1950 Call Bearer Control interface between a CSF and BIWF to enable the use of Continuity Test procedures in a BIWF. It is applicable for Continuity Test procedures for 2 and 4 wire speech circuits. For example procedures see 2.1.8/Q.764, clauses 7 and 8/Q.724 and 7.6/Q.1902.4.

B.2 References

B.2.1 Normative

– ITU-T Recommendation Q.724 (1988), *Telephone user part signalling procedures.*

– ITU-T Recommendation Q.764 (1999), *Signalling System No. 7 – ISDN user part signalling procedures.*

– ITU-T Recommendation Q.1902.4 (2001), *Bearer Independent Call Control protocol (Capability Set 2): Basic call procedures.*

B.3 Definitions

–

B.4 Abbreviations

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B.5 Definition of signalling flow objects

The following objects are the signalling objects to be carried by the commands in the transactions.

1) continuity check verify: This is an indication from the BIWF to a CSF that the continuity check has been completed and returns the result of the check: success or failure.

2) continuity check: This is an indication from the CSF to a BIWF to generate a Continuity Check Tone.

3) continuity check response: This is an indication from the CSF to a BIWF to generate a Response to a continuity check.

B.6 Continuity check CBC capability set

As per clause 6 with the following additions.

B.6.1 Required standard packages

The following package is to be used when using Continuity Check across the CBC interface:

• E.10/H.248.1 Basic Continuity Package.

B.7 CBC procedures – Call related

This clause contains the Call-Related procedures for Continuity Check when used in conjunction with Q.1950.

B.7.1 CSM transactions

The following transactions are used to indicate that a procedure is to be initiated by the CSM. The transaction leads to commands being sent across the CBC interface.

Table B.1/Q.1950 – Call-related CSM-originated transactions on the CBC interface

Transaction	Description
ContCheck_Tone	This transaction is used to indicate to the BIWF that it should initiate outgoing continuity check procedures.
ContCheck_Resp	This transaction is used to indicate to the BIWF that it shall apply a response according to continuity check incoming procedures.

B.7.1.1 Continuity check tone

When the transaction "ContCheck_Tone" is required, the CSM sends a command to the BCF. The command indicates that the continuity check tone shall be sent. The BCF shall notify the CSF when it receives a response to the initial tone or fails to get a response to the initial tone. The following procedure is initiated.

---

1 ADD.req/MOD.req/MOV.req (…, ContCheck_Tone) CSM to BCF

Address Information	Control information	Bearer information
As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify with the following additions: Signal = Continuity Check Notification required = (Event ID = x, "Continuity Check Verify") If required: Signal Timing = duration	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify

Upon reception of the command, the BIWF shall:

- validate the request;
- Initiate a Continuity Check Tone for the specified termination for a certain duration that may be specified or provisioned, start appropriate timers (7.4.1/Q.724), wait for the receipt of the response tone and send command (2).

Upon completion of processing command (1) a ADD.resp/MOD.resp/MOV.resp command (2) is sent.

2 ADD.resp/MOD.resp/MOV.resp BCF to CSM

Address Information	Control information	Bearer information
As per flow (2) 7.1.1/Q.1950 Prepare_BNC_Notify	As per flow (2) 7.1.1/Q.1950 Prepare_BNC_Notify	As per flow (2) 7.1.1/Q.1950 Prepare_BNC_Notify

B.7.1.2 Continuity check response

When the transaction "ContCheck_Resp" is required, the CSM sends a command to the BCF. The command indicates that a Continuity Check Response tone is sent or returned. The following procedure is initiated.

1 ADD.req/MOD.req/MOV.req (…, ContCheck_Resp) CSM to BCF

Address Information	Control information	Bearer information
As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify with the following addition: Signal = Continuity Check Response [On/Off]	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify

Upon reception of the command, the BIWF shall:

- validate the request
- If the continuity Check Response signal is indicated to be "On" on the BIWF shall:
  - Send command (2).
  - For 4 wire, insert a loop-back on the temination and to return the tone to the originator of the Continuity Check Tone. For 2 wire the BIWF while receiving the Continuity Check Tone shall return the Response tone signal to the originator of the Continuity Check Tone. When the BIWF ceases to detect the Continuity check tone it shall stop sending the Response Tone.
- If the Continuity Check Response is indicated to be "Off" the BIWF shall remove the signal or loopback.

Upon completion of processing command (1) a ADD.resp/MOD.resp/MOV.resp command (2) is sent.

2 ADD.resp/MOD.resp/MOV.resp BCF to CSM

Address Information	Control information	Bearer information
As per flow (2) 7.1.1/Q.1950 Prepare_BNC_Notify	As per flow (2) 7.1.1/Q.1950 Prepare_BNC_Notify	As per flow (2) 7.1.1/Q.1950 Prepare_BNC_Notify

B.7.2 BIWF transactions

The following transaction indicates that a procedure is to be initiated in the BIWF. The transaction maps to events generated by the BIWF.

Table B.2/Q.1950– Call-related BIWF-originated transactions on the CBC interface.

Transaction	Description
ContCheck_Verify	This transaction indicates to the CSF whether or not the Continuity Check verification was successful. If no tone has been detected this shall be indicated as a failure. If a tone is detected a success shall be indicated.

B.7.2.1 Continuity check verify

When the transaction "ContCheck_Verify" is required the following procedure is initiated. If the Continuity Response Tone is detected the Continuity Test Signal is stopped. The Continuity Check Verify event is generated with the value of the result parameter equal to success when the Continuity Response tone has ceased to be detected and it is determined that the residual tone has propogated through the path. If no Continuity Response Tone is detected in the time indicated in 7.4.1/Q.724 then an event indicating Continuity Check Verification failure is returned.

1	Notify.ind		BCF to CSM
	Address Information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Termination ID = bearer1 Event = (Event ID = x, "Continuity Check Verify [Success / Fail]")	

Upon reception of the Notify command, it is indicated that:

- The continuity check has successfully finished or that it has failed.

Upon completion of processing command (1) a Notify.resp is sent:

2	Notify.resp		BCF to CSM
	Address Information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = c1 Termination ID = bearer1	

B.8 Formats and codes

This clause outlines the encoding of the Continuity Check procedures when used with the CBC protocol.

B.8.1 Formats and codes – General

As per 10.1.

B.8.2 Formats and codes – Commands

As per 10.2.

B.8.3 Formats and codes – Signalling objects

Table B.3/Q.1950 – CBC signalling object to H.248.1 coding mapping table

<table>
<tr><th>CBC Signalling object</th><th>H.248.1 descriptor</th><th colspan="2">H.248.1 coding</th></tr>
<tr><td rowspan="3">Event (Event ID = x, "y")</td><td rowspan="3">ObservedEventsDescriptor</td><td colspan="2">As per Annexes A or B/H.248.1.
The event ID is encoded as per Annexes A or B/H.248.1.
The format of the event y is defined in the relevant Packages.</td></tr>
<tr><td>Where y is:</td><td>Relevant Package (clause):</td></tr>
<tr><td>Continuity Check Verify</td><td>E.10/H.248.1 and E.10.2/H.248.1 "Completion Observed Event".</td></tr>
<tr><td rowspan="3">Notification Requested(Event ID = x, "y")</td><td rowspan="3">EventDescriptor</td><td colspan="2">As per Annexes A or B/H.248.1.
The event ID is encoded as per Annexes A or B/H.248.1.
The format of the event y to be detected by the MG is defined in the relevant Packages.</td></tr>
<tr><td>Where y is:</td><td>Relevant Package (clause):</td></tr>
<tr><td>Continuity Check Verify</td><td>E.10/H.248.1 and E.10.2/H.248.1 "Completion Event".</td></tr>
<tr><td rowspan="4">Signal = x</td><td rowspan="4">SignalDescriptor</td><td colspan="2">As per Annexes A or B/H.248.1. The format of the signal x to be detected by the MG is defined in the relevant Packages.</td></tr>
<tr><td>Where x is:</td><td>Relevant Package (clause):</td></tr>
<tr><td>Continuity Check Tone</td><td>As per E.10.3/H.248.1 "Basic Continuity Package" and E.10.3/H.248.1 "Continuity Tone".</td></tr>
<tr><td>Continuity Check Response Tone</td><td>As per E.10.3/H.248.1 "Basic Continuity Package" and E.10.3/H.248.1 "Respond".</td></tr>
<tr><td>SignalTiming = duration</td><td>SignalDescriptor</td><td colspan="2">Duration is encoding as per Annex A/H.248.1 "duration" or Annex B/H.248.1 "sigDuration" and is associated with the signal specified in the transaction.</td></tr>
</table>

Annex C

Call bearer control – BIWF congestion handling

C.1 Introduction

This annex describes the enhancements to the Q.1950 Call Bearer Control interface to enable the use of BIWF Resource Congestion Handling procedures. Congestion in this annex relates to the congestion of the BIWF resources, it does not describe the handling of userplane or signalling bearer related congestion.

C.2 References

C.2.1 Normative

– ITU-T Recommendation H.248.10 (2001), *Gateway control protocol: Media gateway resource congestion handling package.*

C.3 Definitions

–

C.4 Abbreviations

–

C.5 Definition of signalling flow objects

The following objects are the signalling objects to be carried by the commands in the transactions.

1) congestion handling: This is an indication from the CSF to a BIWF to initiate congestion handling procedures.

2) congestion reduction: This indicates that the CSF should reduce the load that it generates toward the BIWF. The percentage of load to reduce is indicated.

C.6 BIWF resource congestion handling CBC capability set

As per clause 6 with the following additions.

C.6.1 Required standard packages

The following package is to be used when using BIWF Resource Congestion Handling across the CBC interface:

• H.248.10 Media Gateway Resource Congestion Handling Package

C.7 CBC procedures – General

This clause contains the general procedures for BIWF Resource Congestion Handling when used in conjunction with Q.1950.

C.7.1 CSM transactions

The following transaction is used to indicate that a procedure is to be initiated by the CSM. The transaction leads to commands being sent across the CBC interface.

Table C.1/Q.1950 – CSM-originated transactions on the CBC interface

Transaction	Description
Congestion_Handling	This transaction is used to indicate to the BIWF that it should initiate BIWF Resource Congestion Handling procedures.

C.7.1.1 Congestion_Handling

When the transaction "Congestion_Handling" is required, the CSM sends a command to the BCF. The command indicates that the BCF should monitor resource usage levels. "Congestion_Handling" may also be provisioned on the BIWF. The BCF shall notify the CSF when it determines that it should reduce load being offered. The following procedure is initiated.

1	ADD.req,MOD.req (…, Congestion_Handling)		CSM to BCF
	Address Information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = Value not significant Termination ID = root Notification required = (Event ID = x, "Congestion Handling")	

Upon reception of the command, the BIWF shall:

- validate the request.
- Initiate monitoring of the usage of resources in the BIWF.

Upon completion of processing command (1) an ADD.resp, MOD.resp command (2) is sent.

2	ADD.resp,MOD.resp		BCF to CSM
	Address Information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = Value not significant Termination ID = Root	

C.7.2 BIWF transactions

The following transaction indicates that a procedure is to be initiated in the BIWF. The transaction maps to events generated by the BIWF.

Table C.2/Q.1950– BIWF originated transactions on the CBC interface.

Transaction	Description
Congestion_Reduction_Indication	This transaction indicates to the CSF that it should reduce the load generated toward the BIWF by the amount specified by the indication. This transaction may be used to reduce the load generated toward the BIWF or to increase the load generated toward the BIWF after a previous reduction.

C.7.2.1 Congestion reduction indication

The transaction "Congestion_Reduction_Indication" is required if by monitoring the resource usage levels the BIWF determines that the CSF should reduce the load it generates toward the BIWF. The BIWF shall determine the percentage of load that it requires the CSF to reduce toward it.

1	Notify.ind		BCF to CSM
	Address Information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = Value not significant Termination ID = Root Event = (Event ID = x, "Congestion Reduction [Percentage]")	

Upon reception of the Notify command, it is indicated that:

- The CSF should change the load toward the BIWF that it received the indication from. The load toward the BIWF may be reduced if the new percentage value is greater than the previously received value. The load toward the BIWF may be increased if the new percentage value is less than the previously received value. Zero percent the ends load reduction toward the BIWF. The CSF shall try to block the indicated percentage of the load that it would otherwise (without any reduction) have generated on the BIWF.

Upon completion of processing command (1) a Notify.resp is sent:

2	Notify.resp		BCF to CSM
	Address Information	**Control information**	**Bearer information**
		Transaction ID = z Context ID = Value not significant Termination ID = Root	

C.8 Formats and codes

This clause outlines the encoding of the BIWF Resource Congestion Handling procedures when used with the CBC protocol.

C.8.1 Formats and codes – General

As per 10.1.

C.8.2 Formats and codes – Commands

As per 10.2.

C.8.3 Formats and codes – Signalling Objects

Table C.3/Q.1950 – CBC signalling object to H.248.1 coding mapping table

CBC Signalling object	H.248.1 descriptor	H.248.1 coding	
Event (Event ID = x, "y")	ObservedEventsDescriptor	The event ID is encoded as per Annexes A or B/H.248.1. The format of the event y is defined in the relevant Packages.	
		Where y is:	**Relevant Package (clause)**:
		Congestion Reduction [Percentage]	4.2.1/H.248.10 "MG Congestion".
Notification Requested(Event ID = x, "y")	EventDescriptor	The event ID is encoded as per Annexes A or B/H.248.1. The format of the event y to be detected by the MG is defined in the relevant Packages.	
		Where y is:	**Relevant Package (clause)**:
		Congestion Handling	4.2.1/H.248.10 "MG Congestion".

Annex D

Call bearer control – N × 64K

D.1 Introduction

This annex describes the enhancements to the Q.1950 Call Bearer Control interface enabling the use of N × 64K Service between a CSF and BIWF. It is assumed that the mapping between circuit and termination ID is known in the CSF.

D.2 References

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D.3 Definitions

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D.4 Abbreviations

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D.5 Definition of signalling flow objects

The following object is the signalling object to be carried by the commands in the transactions.

1) N × 64K termination list: Is the list of terminations that relate to N number of circuits required to realise the N × 64K Service. The N × 64K Termination List shall represent the circuits contained in the ISUP Circuit Assignment Map.The terminations in the N × 64K Termination List may be provided to or requested from the BIWF.

D.6 N × 64K CBC capability set

As per clause 6.

D.7 CBC procedures – Call related

This clause contains the Call-Related procedures for the N × 64K Service when used in conjunction with Q.1950.

D.7.1 CSM transactions

The following transaction is used to indicate that a procedure is to be initiated by the CSM. The transaction leads to commands being sent across the CBC interface.

Table D.1/Q.1950 – Call-related CSM originated transactions on the CBC interface

Transaction	Description
N × 64K	This transaction is used to indicate to the BIWF that the N × 64K Service is used.

D.7.1.1 N × 64K

When the transaction "*N × 64K"* is required the following procedure is initiated.

An ADD.req, MOD.req or MOV.req command is sent with the following information.

1 ADD.req/MOD.req/MOV.req (…, N × 64K) CSM to BIWF

Address Information	**Control information**	**Bearer information**
As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify With the following additions: If CSF selected: N × 64K Termination List = (Tid1..TidN) If BIWF selected: N × 64K Termination List = ?	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify

Upon reception of the command, the BIWF shall:

- Provide a logical linkage between the TerminationID (from the Prepare_BNC_Notify) and the N × 64K Termination List, whereby the TerminationID represents the N × 64K multiplexed service.

- In the case where the CSF requests the BIWF to choose the "N × 64K Termination List" it must provide N Termination Ids (e.g. Tid?, Tid?, Tid? For 3 x 64K) in the N × 64K termination list.
- Assign Terminations representing a circuit/timeslot with bearer information based upon the TerminationID representing the N × 64K multiplexed service according to the "N × 64K termination List" and provide synchronisation between the terminations in the "N × 64K Termination List".
- Send the response to the requests in command (2).

Upon completion of processing command (1) an ADD.resp, MOD.resp or MOV.resp command (2) is sent.

2 ADD.resp/MOD.resp/MOV.resp **BIWF to CSM**

Address Information	**Control information**	**Bearer information**
As per flow (2) 7.1.1/Q.1950 Prepare_BNC_Notify	As per flow (2) 7.1.1/Q.1950 Prepare_BNC_Notify with the following additions: If requested: N × 64K Termination List = (Tid1..TidN)	As per flow (2) 7.1.1/Q.1950 Prepare_BNC_Notify

D.7.2 BIWF transactions

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D.8 Formats and codes

This clause outlines the encoding of the N × 64K Service when used with the CBC protocol.

D.8.1 Formats and codes – General

As per 10.1.

D.8.2 Formats and codes – Commands

As per 10.2.

D.8.3 Formats and codes – Signalling objects

Table D.2/Q.1950 – CBC signalling object to H.248.1 coding mapping table

CBC signalling object	H.248.1 descriptor	H.248.1 coding
N × 64K Termination ID List = (Tid1..TidN)	Mux Descriptor	As defined in Annexes A and B/H.248.1 MuxDescriptor Termination ID list according to 7.1.3/H.248.1. N shall be the number of terminations in the list and N × 64K shall be the multiplex type.

Annex E

Call bearer control – Extensions for access networks that support BICC

E.1 Introduction

This annex describes the enhancements to the Q.1950 Call Bearer Control interface to access networks that support BICC. It describes additional signalling objects and procedures.

E.2 References

E.2.1 Normative

– ITU-T Recommendation Q.1930 (2002), *BICC access network protocol*.

E.3 Definitions

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E.4 Abbreviations

LSP Label Switch Path

VPCI Virtual Path Connection Identifier

E.5 Definition of signalling flow objects

The following object is the signalling object to be carried by the commands in the transactions.

1) Connection group identifier: This is defined in ITU-T Rec. Q.1930. It is an indication sent by the CSF to the BIWF that uniquely identifies a group of bearer resources within the BICC network that are dedicated to a specific purpose, e.g. permanent facilities dedicated to a customer.

E.6 CBC capability set for access networks that support BICC

As per clause 6 with the following additions.

E.6.1 Required standard packages

The following package is extended for the conveyance of the Connection Group Identifier across the CBC interface:

- Generic Bearer Connection Package, clause A.6.

E.6.2 BICC packages

The following is a new package that this capability set introduces:

Optional BICC functionality (depending upon the network services deployed in the network):

- Connection Group Identity, clause E.9.

E.7 CBC procedures – Call related

This clause contains the general procedures for conveyance of the Connection Group Identifier in conjunction with Q.1950.

The Connection Group Identifier in the call bearer control is used in conjunction with the same capability in the BICC access network described in Q.1930. Use of the Connection Group ID in call bearer control is not essential to the operation of the same capability in the BICC access network. That is, the ability to convey the Connection Group ID across the call bearer control expands the number of BICC bearer setup options available to a BICC access network, however, it is not essential for the implementation of permanent virtual facilities in a BICC access network.

These procedures describe the enhancements to the Q.1950 Call Bearer Control interface to enhance capabilities of access networks that support BICC for use of the Connection Group Identifier on the interface between the BICC-enabled network and an access network that supports BICC. They relate to the conveyance across the call bearer control interface of the Connection Group Identifier to enable the selection of a permanent virtual facility in the bearer interworking function. They do not describe the handling of the permanent virtual facility within the user plane or within the signalling plane for the bearer.

Extensions to the Q.1950 Call Bearer Control interface for the BICC Access Network: One new definition is added in the Local Control Descriptor for the Establish BNC and the Prepare BNC transaction for interworking with bearer control functions in the BICC Access Network.

E.7.1 CSM transactions

The following transaction is used to indicate that a procedure is to be initiated by the CSM. The transaction leads to commands being sent across the CBC interface.

Table E.1/Q.1950 – CSM-originated transactions on the CBC interface

Transaction	Description
Connection_Group_Identity	This value is used to indicate to the BIWF that it should select a termination on the BIWF that meets the criteria specified in the Connection Group Identifier.

E.7.1.1 Connection group identity

When the selection of a connection group is indicated by service logic the CSM includes in a command to the BCF the "*Connection_Group_Identity*". The BCF will select a termination and a BNC-ID for that termination based on the "*Connection_Group_Identity*".

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1 ADD.req,MOD.req,MOV.req (…, Connection Group ID) CSM to BCF

Address Information	**Control information**	**Bearer information**
As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify with the following addition: Notification required = (Event ID = x, "Connection Group")	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify

Upon reception of the command, the BIWF shall:

- validate the request,
- select a termination that meets the connection group criteria.

Upon completion of processing command (1) an ADD.resp, MOD.resp, MOV.resp command (2) is sent.

2	**ADD.resp,MOD.resp, MOV.resp**		**BCF to CSM**
	Address Information	**Control information**	**Bearer information**
	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify

E.7.2 BIWF transactions

None

E.8 Formats and codes

This clause outlines the encoding of the Connection Group Identifier when used with the CBC protocol.

E.8.1 Formats and codes – General

As per 10.1.

E.8.2 Formats and codes – Commands

As per 10.2.

E.8.3 Formats and codes – Signalling Objects

Table E.2/Q.1950 – CBC signalling object to H.248.1 coding mapping table

CBC signalling object	H.248.1 descriptor	H.248.1 coding
Connection Group	LocalControl	As per E.9 Connection Group Identity Package.

E.9 Package Definition

Package Name: Connection Group Identity
Package ID: XG (0x0067)
Description:

This package contains the functionality required to indicate the Connection Group Identity. One new definition is added in the Local Control Descriptor for the Establish BNC and the Prepare BNC signals for interworking with bearer control functions in the BICC Access Network. The Connection Group ID is required information in a BIWF if a connection is to be established in the direction toward the BICC Access Network and the private virtual facility capability is invoked.

Version: 1
Extends: GB (0x0021), version 1

E.9.1 Properties

E.9.1.1 Connection group identifier

Property Name: Connection Group Identifier
PropertyID: 0x0001,ID
Description: Connection Group Id

Type: Octet String
Possible Values: The coding of the Connection Group Identifier is implementation specific. The content of the Connection Group Identifier indicates a private virtual facility to which the requested bearer connection is to be assigned on the access network side of the BIWF. For use in BICC Access networks the Connection Group ID is coded according to ITU-T Rec. Q.1930. Text implementations shall use the hexadecimal octet encoding of the Connection Group ID according to Annex B.3/H.248.1.
Defined in: Local Control
Characteristics: Read & Write

E.9.2 Events

None

E.9.3 Signals

None

E.9.4 Statistics

None

E.9.5 Procedures

The BIWF uses the Connection group identifier to assign the connection to the appropriate resource. BIWF uses Connection group identifier to derive the connection identifier to be used in bearer control signalling (if applicable), e.g. Connection Group maps to ATM VPCI, AAL Type 2 Path, explicit LSP.

The connection group is provided by the CSF and obtained from higher-level service logic.

Annex F

Call bearer control – Emergency call indication

F.1 Introduction

This annex describes the enhancements to the Q.1950 Call Bearer Control interface enabling the CSF to indicate to a BIWF that a particular context/call is being used for an Emergency Call Service.

F.2 References

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F.3 Definitions

–

F.4 Abbreviations

ECS Emergency Call Service

F.5 Definition of signalling flow objects

The following object is the signalling object to be carried by the commands in the transactions.

1) emergency call indicator: Indicates that the terminations and bearer connections in the specified context are associated with an Emergency call.

F.6 Emergency service capability set

As per clause 6.

F.7 CBC procedures – Call-related

This clause contains the Call-Related procedures for the ECS Service when used in conjunction with Q.1950.

F.7.1 CSM transactions

The following transaction is used to indicate that a procedure is to be initiated by the CSM. The transaction leads to commands being sent across the CBC interface.

Table F.1/Q.1950 – Call-related CSM originated transactions on the CBC interface

Transaction	Description
ECS_Indication	This transaction is used to indicate to the BIWF that the ECS Service is used.

F.7.1.1 ECS_Indication

When the transaction "*ECS_Indication*" is required the following procedure is initiated.

An ADD.req, MOD.req or MOV.req command is sent with the following information.

1 ADD.req/MOD.req/MOV.req (…, ECS_Indication) CSM to BIWF

Address Information	**Control information**	**Bearer information**
As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or With the following additions: If Context Requested & Emergency Call: Emergency Call Indicator OR: As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify With the following additions: If Context is NOT provided & Emergency Call: Emergency Call Indicator	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify

Upon reception of the command, the BIWF shall:

- If the Emergency Call Indicator is present, apply preference handling with respect to all terminations and bearer connections associated with the specified context. Mapping to any priority values present in the relevant bearer control protocol, including the application of pre-emption, is out of scope of this Recommendation.
- Apply the procedures of 7.1.1/Q.1950 Prepare_BNC or 7.1.2/Q.1950 Establish_BNC_Notify as applicable.

Upon completion of processing command (1) an ADD.resp, MOD.resp or MOV.resp command (2) is sent.

2 ADD.resp/MOD.resp/MOV.resp BIWF to CSM

Address Information	Control information	Bearer information
As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify	As per flow (1) 7.1.1/Q.1950 Prepare_BNC_Notify or As per flow (1) 7.1.2/Q.1950 Establish_BNC_Notify

F.7.2 BIWF transactions

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F.8 Formats and codes

This clause outlines the encoding of the ECS when used with the CBC protocol.

F.8.1 Formats and codes – General

As per 10.1.

F.8.2 Formats and codes – Commands

As per 10.2.

F.8.3 Formats and codes – Signalling objects

Table F.2/Q.1950 – CBC signalling object to H.248.1 coding mapping table

CBC signalling object	H.248.1 descriptor	H.248.1 coding
Emergency Call Indicator	NA	6.1.1/H.248.1 Emergency Call Indicator encoded as per Annexes A or B/H.248.1 Emergency Call context attribute.

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