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Technical Specification

**Digital cellular telecommunications system (Phase 2+);  
Universal Mobile Telecommunications System (UMTS);  
LTE;  
Interconnection Border Control Functions (IBCF)  
- Transition Gateway (TrGW) interface, Ix interface;  
Stage 3  
(3GPP TS 29.238 version 11.1.0 Release 11)**



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## Foreword

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# Foreword

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# 1 Scope

The present document describes the protocol to be used on the Interconnection Border Control Function (IBCF) – Transition Gateway (TrGW) interface and the CS-IBCF – CS-TrGW interface. The basis for this protocol is the H.248 protocol as specified in ITU-T. The Profile provides MG control function for IMS and CS Border Control. The IMS architecture is described in 3GPP TS 23.228 [2]. The underlying reference model and stage 2 information is described in Annex I of 3GPP TS 23.228 [2] and in 3GPP TS 29.162 [18]. The CS architecture is described in Annex A of 3GPP TS 29.235 [17].

This specification describes the application of H.248 Ix profile for both Ix and CS-Ix interfaces (see Figure 1.1 and Figure 1.2). Required extensions use the H.248 standard extension mechanism. In addition certain aspects of the base protocol H.248 are not needed for this interface and thus excluded by this profile.

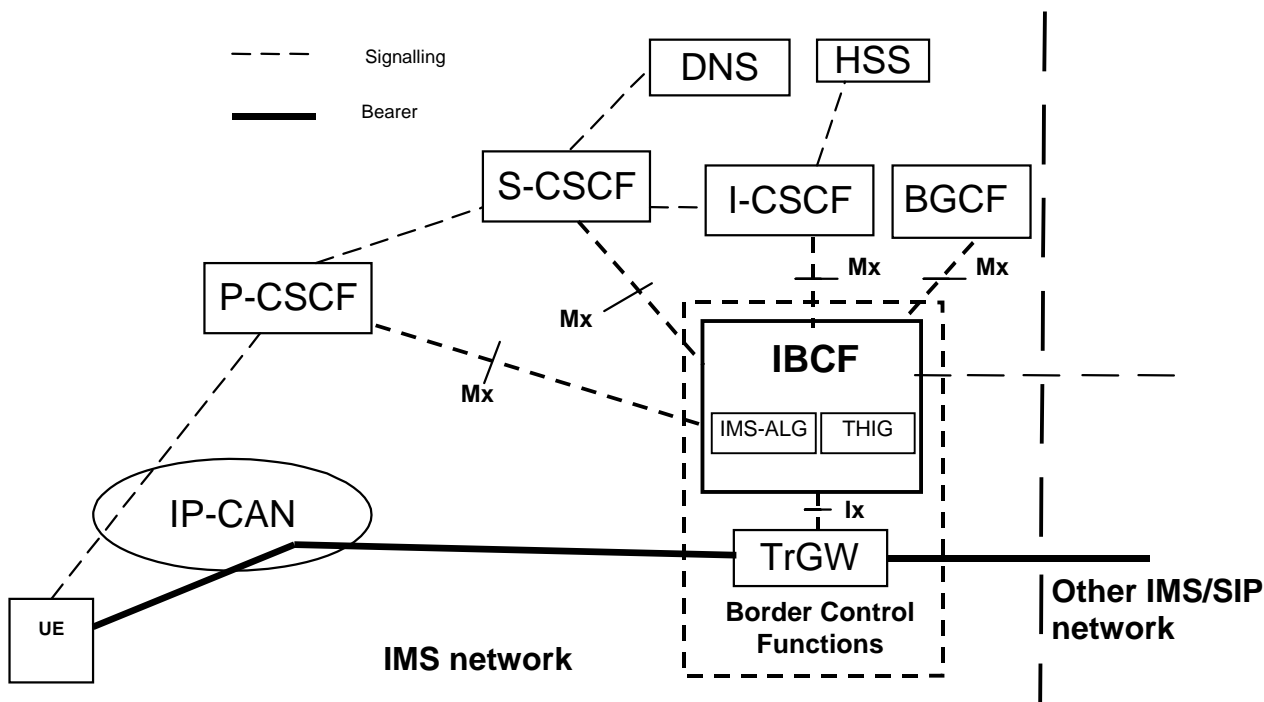


Figure 1.1: Reference model for IMS Border Control Functions

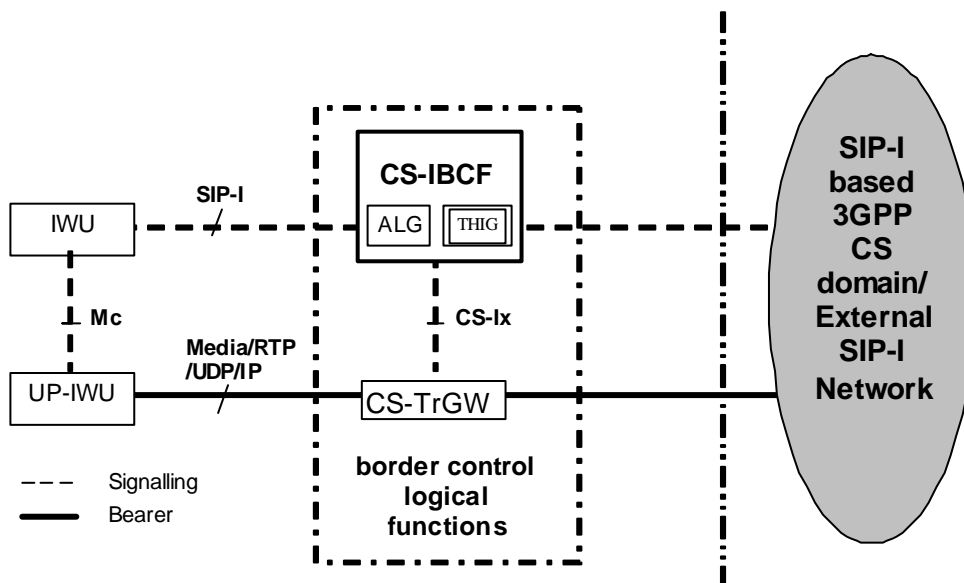
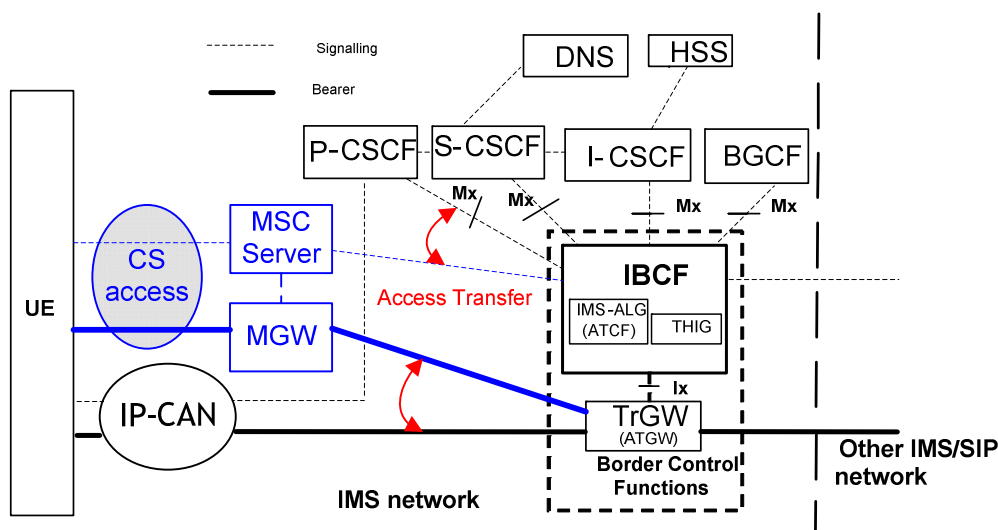


Figure 1.2: Reference model for CS Border Control Functions



The reference model for the IBCF and the TrGW supporting the ATCF/ATGW function is shown in Figure 1.x below.



**Figure 1.3: Reference model for IBCF/TrGW with ATCF/ATGW function**

See 3GPP TS 23.237 [38] subclause 5.2 for a comprehensive description of the reference model.

NOTE: The Ix profile is applied over both IMS and CS Ix interfaces.

In the following text the terms IBCF and TrGW also include respectively the CS-IBCF and CS-TrGW functionalities.

## 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS); Stage 2".
- [3] ITU-T Recommendation H.248.1 (2002): "Gateway Control Protocol: Version 2" including the Corrigendum 1 for Version 2 (03/04).
- [4] ETSI TS 183 018 V3.5.1(2009-07): "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control: H.248 Profile Version 3 for controlling Border Gateway Functions (BGF) in the Resource and Admission Control Subsystem (RACS); Protocol specification".
- [5] ITU-T Recommendation H.248.57 (06/2008): "Gateway control protocol: RTP Control Protocol Package".
- [6] ITU-T Recommendation H.248.43 (06/2008): "Gateway control protocol: Gate Management and Gate Control packages".
- [7] IETF RFC 3605 (2003): "Real Time Control Protocol (RTCP) attribute in Session Description Protocol (SDP)".

- [8] IETF RFC 4566 (2006): "SDP: Session Description Protocol".
- [9] IETF RFC 4975 (2007): "The Message Session Relay Protocol (MSRP)".
- [10] IETF RFC 3551 (2003): "RTP Profile for Audio and Video Conferences with Minimal Control".
- [11] IETF RFC 4145 (2005): "TCP-Based Media Transport in the Session Description Protocol (SDP)".
- [12] ITU-T Recommendation H.248.52 (06/2008): "Gateway control protocol: QoS support packages".
- [13] ITU-T Recommendation H.248.53 (06/2008) inclusive *Revision 1* (03/2009): "Gateway control protocol: Traffic management packages".
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- [15] ITU-T Recommendation H.248.36 (09/2005): "Gateway control protocol: Hanging Termination Detection package".
- [16] ITU-T Recommendation H.248.11 (11/2002): "Gateway control protocol: Media gateway overload control package".  
Inclusive Corrigendum 1 (06/2008) to H.248.11 "Gateway control protocol: Media gateway overload control package: Clarifying MG-overload event relationship to ADD commands".
- [17] 3GPP TS 29.235: "Interworking between SIP-I based circuit-switched core network and other networks".
- [18] 3GPP TS 29.162: "Interworking between the IM CN subsystem and IP networks".
- [19] ITU-T Recommendation H.248.14 (03/2009): "Gateway control protocol: Inactivity timer package".
- [20] ITU-T Recommendation H.248.10 (07/2001): "Media gateway resource congestion handling package".
- [21] 3GPP TS 29.232: "Media Gateway Controller (MGC) - Media Gateway (MGW) interface; Stage 3".
- [22] 3GPP TS 33.210: "Technical Specification Group Services and System Aspects; 3G Security; Network Domain Security; IP Network Layer Security".
- [23] ITU-T Recommendation V.152 (01/2005): "Procedures for supporting voice-band data over IP networks".
- [24] ITU-T Supplement 7 to ITU-T H-series Recommendations H.Sup7 (05/2008): "Gateway control protocol: Establishment procedures for the H.248 MGC-MG control association".
- [25] IETF RFC 5234 (2008): "Augmented BNF for Syntax Specifications: ABNF".
- [26] IETF RFC 4960 (2007): "Stream control transmission protocol".
- [27] ITU-T Recommendation H.248.40 (01/2007): "Gateway control protocol: Application Data Inactivity Detection package".
- [28] ITU-T Recommendation X.690 (11/2008): "ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)".
- [29] IETF RFC 3556 (2003): "Session Description Protocol (SDP) Bandwidth Modifiers for RTP Control Protocol (RTCP) Bandwidth".
- [30] IETF RFC 4585 (2006): "Extended RTP Profile for Real-time Transport Control Protocol (RTCP) - Based Feedback (RTP/AVPF)".
- [31] 3GPP TS 26.114: "IP Multimedia Subsystem (IMS); Multimedia telephony; Media handling and interaction".

- [32] IETF RFC 2216 (1997): "Network Element Service Specification Template".
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- [34] IETF RFC 5124 (2008): "Extended Secure RTP Profile for Real-time Transport Control Protocol (RTCP)-Based Feedback (RTP/SAVPF)".
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- [36] IETF RFC 3611 (2003): "RTP Control Protocol Extended Reports (RTCP XR)".
- [37] IETF RFC 3168 (2001): "The Addition of Explicit Congestion Notification (ECN) to IP".
- [38] 3GPP TS 23.237: "IP Multimedia subsystem (IMS) Service Continuity; Stage 2".
- [39] 3GPP TS 22.153: "Multimedia Priority Service".

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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**Address:** term used for "network address" (IP address)

**CS-TrGW:** packet-to-packet gateway for user plane media traffic. The CS-TrGW performs both policy enforcement functions and NA(P)T functions under the control of the CS-IBCF

**Port:** term used for "transport port" (L4 port).

**TRANSCODING:** transcoding in general is the translation from one type of encoded media format to another different media format, e.g. G.711 A-law to  $\mu$ -law or vice versa, G.729 to AMR with 4.75 rate.

NOTE 1: The definition of "transcoding" is according clause 3.10/ITU-T Recommendation V.152 [23].

NOTE 2: Transcoding belongs to the category of "media aware" IP-to-IP interworking.

**Transport Address:** term used for the combination of a *Network Address* and a *Transport Port*.

**TrGW:** packet-to-packet gateway for user plane media traffic. The TrGW performs both policy enforcement functions and NA(P)T functions under the control of the IBCF

NOTE 3: A Transition Gateway (TrGW) provides the interface between two IP-transport domains. The TrGW has the "H.248 MG" role in the scope of this Profile.

### 3.2 Symbols

For the purposes of the present document, the following symbols apply:

Ix                      Interface between IBCF and TrGW or CS-IBCF and CS-TrGW.

### 3.3 Abbreviations

For the purposes of the present document the abbreviations defined in 3GPP TR 21.905 [1] apply, with the following additions. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

ABNF                    Augmented Backus-Naur Form  
ATCF                    Access Transfer Control Function

|         |  |
|---------|--|
| ATGW    | Access Transfer Gateway  |
| BGF     | Border Gateway Function  |
| CE      | Congestion Experienced   |
| ECN     | Explicit Congestion Notification   |
| GCP     | Gateway Control Protocol   |
| IBCF    | Interconnect Border Control Function   |
| LD      | Local Descriptor (H.248 protocol element)  |
| MG      | Media Gateway  |
| MGC     | Media Gateway Controller   |
| MPS     | Multimedia Priority Service  |
| NA      | Not Applicable   |
| NAPT    | Network Address and Port Translation   |
| NAPT-PT | NAPT and Protocol Translation  |
| NAT     | Network Address Translation  |
| PCI     | Protocol Control Information   |
| RD      | Remote Descriptor (H.248 protocol element)   |
| RTCP    | RTP Control Protocol   |
| SRVCC   | Single Radio Voice Call Continuity   |
| ToS     | Type-of-Service  |
| TrGW    | Transition Gateway   |
| TISPAN  | Telecommunications and Internet converged Services and Protocols for Advanced Networking |

---

## 4 Applicability

The support of the IMS and CS Ix interfaces capability sets shall be identified by the H.248 Ix profile and support of this profile shall be indicated in H.248 ServiceChange procedure (during the (re-)registration phase(s)).

### 4.1 Architecture

See Annex I of 3GPP TS 23.228 [2], Annex A of 3GPP TS 29.235 [17] and 3GPP TS 29.162 [18].

---

## 5 Profile Description

### 5.1 Profile Identification

**Table 5.1.1: Profile Identification**

|                      |                 |
|----------------------|-----------------|
| <b>Profile name:</b> | <b>threeglx</b> |
| Version:             | 2               |

### 5.2 Summary

This profile supports the control of the following functionality in (IP-to-IP) Transition Gateways:

- Allocation and translation of IP addresses and port numbers (NA(P)T and NA(P)T-PT);
- Hanging termination detection;
- IP realm/domain indication;
- Media inactivity detection;
- Opening and closing gates (i.e. packets filtering depending on "IP address / port");
- Policing of incoming traffic;

- QoS packet marking for outgoing traffic (differentiated services);
- RTCP handling;
- Explicit Congestion Notification support;
- Multimedia Priority Service;

and when ATCF/ATGW is supported:

- Handover of bearer connections between PS and CS access networks;
- IP version interworking;
- Audio transcoding.

In addition, optional settings and procedures are described which fulfil optional features. The minimum mandatory settings within the optional procedures and packages are identified that must be supported in order to support that feature.

"Optional" or "O" means that it is optional for either the sender or the receiver to implement an element. If the receiving entity receives an optional element that it has not implemented it should send an Error Code (e.g. 445 "Unsupported or Unknown Property", 501 "Not Implemented", etc.). "Mandatory" or "M" means that it is mandatory for the receiver to implement an element. Whether it is mandatory for the sender to implement depends on specific functions; detail of whether elements of the core protocol are mandatory to be sent are defined in the stage 2 procedures, stage 3 procedures and/or the descriptions of individual packages.

The setting or modification of elements described in the profile under the heading "Used in Command" has the meaning that the property can be set/modified with that command. The property may be present in other commands (in order to preserve its value in accordance with ITU-T Recommendation H.248.1 [3]) when those commands are used for other procedures that affect the same descriptor.

## 5.3 Gateway Control Protocol Version

Version 2 (ITU-T Recommendation H.248.1 [3]) shall be used as the minimum protocol version.

## 5.4 Connection model

**Table 5.4.1: Connection Model**

|  |   |
|--|---|
| <b>Maximum number of contexts:</b>                         | Provisioned   |
| <b>Maximum number of terminations per context:</b>         | 3   |
| <b>Allowed termination type combinations in a context:</b> | (IP,IP) ;<br>(IP,IP,IP) (NOTE)  |
| <b>NOTE:</b>   | This is only a temporary context configuration, occurring during bearer access transfer phase (between PS to CS access networks or vice versa). |

## 5.5 Context attributes

**Table 5.5.1: Context Attributes**

| Context Attribute                  | Supported         | Values Supported |
|------------------------------------|-------------------|------------------|
| <b>Topology</b>                    | Yes (NOTE 1)      | See clause 5.7.9 |
| <b>Priority Indicator</b>          | Optional (NOTE 2) | 0-15 (NOTE 3)    |
| <b>Emergency Indicator</b>         | Yes               | YES/NO           |
| <b>IEPS Indicator</b>              | No                | NA               |
| <b>ContextAttribute Descriptor</b> | No                | NA               |
| <b>ContextIdList Parameter</b>     | No                | NA               |
| <b>AND/OR Context Attribute</b>    | No                | NA               |

NOTE 1: Stream ID in Topology Descriptor shall not be supported (because only used for SRVCC service support, which is a monomedia type of call ("voice call")).

NOTE 2: This Context Attribute parameter is allowed in ETSI TISPAN Ia Profile version 3. It is also used for MPS as specified in 3GPP TS 22.153 [39].

NOTE 3: Priority values 11 – 15 of the Priority Indicator are reserved for MPS.

## 5.6 Terminations

### 5.6.1 Termination names

#### 5.6.1.1 IP Termination

##### 5.6.1.1.1 ABNF Coding Overview and prose specification

The Termination ID structure shall follow the guidelines of H.248 and shall be based on four fields:

- "ip/<group>/<interface>/<id>".

The individual fields are described and defined in table 5.6.1.1.1.1.

**Table 5.6.1.1.1.1: IP Termination Fields**

| Name      | Description   | Values                                   | CHOOSE Wildcard | ALL Wildcard |
|-----------|---|--|-----------------|--------------|
| ip        | "ip" is a fixed prefix identifying the termination  | "ip"                                     | No              | No           |
| Group     | Group of Interface and Id   | Integer (0-65535)                        | Yes (NOTE 5)    | Yes          |
| Interface | Logical or physical interface to a network to/from which the termination will be sending/receiving media. (NOTE 1, NOTE 2). | String of max 51 alphanumeric characters | Yes (NOTE 4)    | Yes          |
| Id        | Termination specific identifier (NOTE 3).   | Non-zero 32 bit integer                  | Yes (NOTE 4)    | Yes          |

NOTE 1: A specific <Interface> may be used together with different groups.

NOTE 2: The generic field <Interface> may relate specifically to an "IP interface", "protocol layer 2 interface" or others.

NOTE 3: The combination of Interface and Id is unique.

NOTE 4: The MGC shall always use CHOOSE in an ADD request command. If not, the MG shall reply with an error descriptor using error code #501 "Not Implemented".

NOTE 5: The CHOOSE wildcard on 'Group' is *not* allowed in ETSI TISPAN "Ia Profiles".

NOTE: The IBCF has the ability to choose the address space in which the TrGW will allocate an IP address for the termination by using the *ipdc/realm* property defined in the ITU-T Recommendation H.248.41 [14] IP domain connection package.

H.248 wildcarding may be applied on IP Termination Identifiers. Wildcarding is limited according the two columns on the right hand side.

The corresponding ABNF grammar is given below:

ABNF (IETF RFC 5234 [25]) is used for the syntax specification. The ABNF for TerminationID and relation to pathNAME is defined in Annex B.2 of ITU-T Recommendation H.248.1 [3].

**ABNF coding:**

```

pathNAME      = EphToken SLASH EPHsystem
EphToken      = "ip"                ; prefix
EPHsystem     = WildcardALL
               / WildcardALL SLASH Interface
               / Group SLASH WildcardALL
               / (Group / WildcardCHOOSE) SLASH (Interface / WildcardCHOOSE) SLASH
(Identifier / WildcardALL / WildcardCHOOSE)
Group         = %d0-65535            ; data type: INT16
Interface     = 1*51ALPHANUM
Identifier    = %d1-4294967295      ; data type: INT32
ALPHANUM      = ALPHA / DIGIT
WildcardCHOOSE = "$"
WildcardALL   = "*"

```

### 5.6.1.1.2 ASN.1 Coding Overview and prose specification

The following general structure of termination ID shall be used:

4 octets shall be used for the termination ID. The following defines the general structure for the termination ID:

**Table 5.6.1.1.2.1: ASN.1 coding**

|                  |   |
|------------------|---|
| Termination type | X |
|------------------|---|

Termination type:

Length 3 bits

Values:

000 Reserved

001 IP (Ephemeral) termination

010 Reserved (in 3GPP Mc and Mn profile used for TDM termination)

011 - 110 Reserved

111 Reserved for ROOT termination Id (ROOT Termination ID = 0xFFFFFFFF)

X:

Length 29 bits.

For IP termination, its usage is un-specified.

## 5.6.2 Multiplexed terminations

**Table 5.6.2.1: Multiplexed Terminations**

|  |    |
|--|----|
| <b>Multiplex Terminations Supported?</b> | No |
|--|----|

*If yes then:*

**Table 5.6.2.2: Multiplex Types**

|  |      |
|--|------|
| <b>Multiplex Types Supported</b>                             | None |
| <b>Maximum Number of Terminations Connected to Multiplex</b> | -    |

## 5.7 Descriptors

### 5.7.1 TerminationState Descriptor

**Table 5.7.1.1: ServiceState property**

|   |   |
|---|---|
| <b>ServiceState property used:</b>  | Yes (InService/OutOfService) NOTE 1, NOTE 2 |
| NOTE 1: This is restricted to the ROOT termination (for MGW audit).   |   |
| NOTE 2: Ephemeral H.248 Terminations have a ServiceState property according to ITU-T Recommendation H.248.1 [3], but explicit usage of the TerminationState Descriptor ServiceState property is not required by this Profile. ServiceState changes can still occur, however, and can be indicated in ServiceChange Commands (i.e. this means that the value of the ServiceState property may be implicitly changed by ServiceChange procedures. |   |

**Table 5.7.1.2: EventBufferControl property**

|  |    |
|--|----|
| <b>EventBufferControl property used:</b> | No |
|--|----|

### 5.7.2 Stream Descriptor

#### 5.7.2.0 General

**Table 5.7.2.1: Stream descriptor**

|  |    |                    |
|--|----|--------------------|
| <b>Maximum number of streams per termination type:</b>   | IP | Unspecified (NOTE) |
| NOTE: At least one stream for each media component (e.g. video+audio = 2 streams). If only one stream is applicable, then the IBCF may omit the Stream Descriptor and the TrGW shall assume that StreamID = 1. |    |                    |

**Table 5.7.2.2: Stream configuration**

|                              |                                |
|------------------------------|--------------------------------|
| <b>Stream Configuration:</b> | ALL configurations are allowed |
|------------------------------|--------------------------------|

#### 5.7.2.1 LocalControl Descriptor

**Table 5.7.2.1.1: Reserve Group and Reserve Value**

|                            |     | <b>Termination Type</b> | <b>Stream Type</b> |
|----------------------------|-----|-------------------------|--------------------|
| <b>Reserve group used:</b> | No  | NA                      | NA                 |
| <b>Reserve value used:</b> | Yes | IP                      | Audio, Video       |
|                            |     |                         |                    |



Table 5.7.2.1.2: Stream Mode

| Termination Type  | Stream Type | Allowed StreamMode Values              |
|---|-------------|--|
| IP  | RTP/AVP     | SendOnly, RecvOnly, SendRecv, Inactive |
|   | RTP/SAVP    | SendOnly, RecvOnly, SendRecv, Inactive |
|   | RTP/AVPF    | SendOnly, RecvOnly, SendRecv, Inactive |
|   | RTP/SAVPF   | SendOnly, RecvOnly, SendRecv, Inactive |
|   | TCP         | SendRecv, Inactive                     |
|   | TCP/MSRP    | SendRecv, Inactive                     |
|   | udptl       | SendRecv, Inactive                     |
|   | udp         | SendOnly, RecvOnly, SendRecv, Inactive |
| NOTE: See table 5.15.2 for the stream types applicable to IMS-Ix and CS-Ix. |             |  |

### 5.7.3 Events descriptor

Table 5.7.3.1: Events Descriptor

| Events settable on termination types and stream types: | Yes  |                  |                |
|--|--|------------------|----------------|
| <i>If yes</i>  | Event ID   | Termination Type | Stream Type    |
|  | Cause (g/cause, 0x0001/0x0001) - See sub-clause 5.14.3.1                       | ALL except ROOT  | ANY            |
|  | Inactivity Timeout (it/ito, 0x0045/0x0001) – See sub-clause 5.14.3.6           | only ROOT        | Not applicable |
|  | MG_Overload (ocp/mg_overload, 0x0051/0x0001) – See sub-clause 5.14.3.8         | only ROOT        | Not applicable |
|  | Termination Heartbeat (hangterm/thb, 0x0098/0x0001) – See sub-clause 5.14.3.9  | ALL except ROOT  | Not applicable |
|  | MGCon (chp/mgcon, 0x0029/0x0001) – See sub-clause 5.14.3.10                    | only ROOT        | Not applicable |
|  | Available Realms Changed (ipra/arc, 0x00e0/0x0001) – See sub-clause 5.14.3.11  | only ROOT        | Not applicable |
|  | IP Flow Stop Detection (adid/ipstop, 0x009c/0x0001) – See sub-clause 5.14.3.14 | ALL except ROOT  | ANY            |
|  | ECN Failure (ecnrousfail, 0x010b/0x0001) see Annex B                           | IP               | RTP Based      |

**Table 5.7.3.2: Event Buffer Control**

|                                   |    |
|-----------------------------------|----|
| <b>Event Buffer Control used:</b> | No |
|-----------------------------------|----|

**Table 5.7.3.3: Keep Active**

|                                   |    |
|-----------------------------------|----|
| <b>Keepactive used on events:</b> | No |
|-----------------------------------|----|

**Table 5.7.3.4: Embedding in event**

|   |    |
|---|----|
| <b>Embedded events in an event descriptor:</b>  | No |
| <b>Embedded signals in an event descriptor:</b> | No |

**Table 5.7.3.5: Regulated Embedded Events**

|  |      |
|--|------|
| <b>Regulated Embedded events are triggered on:</b> | None |
|--|------|

**Table 5.7.3.6: Reset Events Descriptor Flag**

|  |      |
|--|------|
| <b>ResetEventsDescriptor used with events:</b> | None |
|--|------|

**Table 5.7.3.7: Notification Behaviour**

|                         |            |
|-------------------------|------------|
| <b>NotifyImmediate:</b> | ALL Events |
| <b>NotifyRegulated:</b> | None       |
| <b>NeverNotify:</b>     | None       |

NOTE: tables 5.7.3.4 – 5.7.3.7 apply to version 3 of ITU-T Recommendation H.248.1 [3].

## 5.7.4 EventBuffer descriptor

**Table 5.7.4.1: Event Buffer**

|                                      |          |
|--------------------------------------|----------|
| <b>Event Buffer descriptor used:</b> | No       |
| <i>If yes</i>                        | EventIDs |

## 5.7.5 Signals descriptor

**Table 5.7.5.1: Signals dependant on termination or streams**

|   |  |                         |                         |
|---|--|-------------------------|-------------------------|
| <b>The setting of signals is dependant on termination or streams types:</b> | No<br>NOTE – "No" means that all signals can be played on any termination or stream. |                         |                         |
| <i>If yes</i>   | <b>Signal ID</b>   | <b>Termination Type</b> | <b>Stream Type / ID</b> |
|   | -  | -                       | -                       |

Table 5.7.5.2: Signal Lists

|                                 |   |   |
|---------------------------------|---|---|
| <b>Signals Lists supported:</b> | No  |   |
| <i>If yes</i>                   | <b>Termination Type Supporting Lists</b>          | - |
|                                 | <b>Stream Type Supporting lists</b>               | - |
|                                 | <b>Maximum number of signals to a signal list</b> | - |
|                                 | <b>Intersignal delay parameter supported:</b>     | - |

Table 5.7.5.3: Overriding Signal type and duration

|  |                  |                                  |
|--|------------------|----------------------------------|
| <b>Signal type and duration supported:</b> | No               |                                  |
| <i>If yes</i>                              | <b>Signal ID</b> | <b>Type or duration override</b> |
|  | -                | -                                |

Table 5.7.5.4: Signal Direction

|                                    |    |
|------------------------------------|----|
| <b>Signal Direction supported:</b> | No |
|------------------------------------|----|

Table 5.7.5.5: Notify completion

|                                    |                  |                                     |
|------------------------------------|------------------|-------------------------------------|
| <b>NotifyCompletion supported:</b> | No               |                                     |
| <i>If yes</i>                      | <b>Signal ID</b> | <b>Type of completion supported</b> |
|                                    | -                | -                                   |

Table 5.7.5.6: RequestID Parameter

|                                       |    |
|---------------------------------------|----|
| <b>RequestID Parameter Supported:</b> | No |
|---------------------------------------|----|

Table 5.7.5.7: Signals played simultaneously

|                                       |   |   |
|---------------------------------------|---|---|
| <b>Signals played simultaneously:</b> | No  |   |
| <i>If yes</i>                         | <b>SignalIDs that can be played simultaneously:</b> | - |

Table 5.7.5.8: Keep Active

|                                    |    |
|------------------------------------|----|
| <b>KeepActive used on signals:</b> | No |
|------------------------------------|----|

## 5.7.6 DigitMap descriptor

Table 5.7.6.1: DigitMap Descriptor

|                             |                      |                  |               |
|-----------------------------|----------------------|------------------|---------------|
| <b>DigitMaps supported:</b> | No                   |                  |               |
| <i>If yes</i>               | <b>DigitMap Name</b> | <b>Structure</b> | <b>Timers</b> |
|                             | -                    | -                | -             |

## 5.7.7 Statistics descriptor

**Table 5.7.7.1: Statistics Descriptor**

|                                 |   |
|---------------------------------|---|
| <b>Statistics supported on:</b> | - |
|---------------------------------|---|

**Table 5.7.7.2: Statistics reported on Subtract**

| <b>Statistics reported on Subtract:</b> |                               | No                      |                    |
|---|-------------------------------|-------------------------|--------------------|
| <i>If yes</i>                           | <b>Statistic IDs Reported</b> | <b>Termination Type</b> | <b>Stream Type</b> |
|   | -                             | -                       | -                  |

## 5.7.8 ObservedEvents descriptor

**Table 5.7.8.1: ObservedEvents Descriptor**

|  |    |
|--|----|
| <b>Event detection time supported:</b> | No |
|--|----|

## 5.7.9 Topology descriptor

**Table 5.7.9.1: Topology descriptor**

|                  |  |
|------------------|--|
| Allowed triples: | (T1, T2, isolate)<br>(T1, T2, bothway)   |
| NOTE:            | The Topology Descriptor shall be supported by the MGW and MGC for handover only, when PS-to-CS access transfer is supported. |

## 5.7.10 Error descriptor

Table 5.7.10.1: Error codes sent by the IBCF

|  |  |
|--|--|
| <b>Supported H.248.8 Error Codes:</b>  | #400 "Syntax error in message"<br>#401 "Protocol Error"<br>#402 "Unauthorized"<br>#403 "Syntax Error in TransactionRequest"<br>#406 "Version Not Supported"<br>#410 "Incorrect identifier"<br>#411 "The transaction refers to an unknown ContextID"<br>#413 "Number of transactions in message exceeds maximum"<br>#421 "Unknown action or illegal combination of actions"<br>#422 "Syntax Error in Action"<br>#430 "Unknown TerminationID"<br>#431 "No TerminationID matched a wildcard"<br>#442 "Syntax Error in Command"<br>#443 "Unsupported or Unknown Command"<br>#444 "Unsupported or Unknown Descriptor"<br>#445 "Unsupported or Unknown property"<br>#446 "Unsupported or Unknown Parameter"<br>#447 "Descriptor not legal in this command"<br>#448 "Descriptor appears twice in a command"<br>#449 "Unsupported parameter or property value"<br>#450 "No such property in this package"<br>#451 "No such event in this package"<br>#454 "No such parameter value in this package"<br>#455 "Property illegal in this Descriptor"<br>#456 "Property appears twice in this Descriptor"<br>#457 "Missing parameter in signal or event"<br>#458 "Unexpected Event/RequestID"<br>#501 "Not Implemented"<br>#502 "Not ready"<br>#505 "Transaction Request Received before a ServiceChange Reply has been received"<br>#506 "Number of TransactionPendings Exceeded"<br>#533 "Response exceeds maximum transport PDU size" |
| <b>Supported Error Codes defined in packages:</b>  | All error codes defined in supported packages are supported.   |
| NOTE: the error codes listed need not be supplied by the IBCF to differentiate each and every error described by them. The TrGW shall be able to receive the error codes listed. |  |

Table 5.7.10.2: Error codes sent by the TrGW

|   |   |
|---|---|
| <b>Supported H.248.8 Error Codes:</b>   | #400 "Syntax error in message"<br>#401 "Protocol Error"<br>#402 "Unauthorized"<br>#403 "Syntax Error in TransactionRequest"<br>#406 "Version Not Supported"<br>#410 "Incorrect identifier"<br>#411 "The transaction refers to an unknown ContextID"<br>#412 "No ContextIDs available"<br>#413 "Number of transactions in message exceeds maximum"<br>#421 "Unknown action or illegal combination of actions"<br>#422 "Syntax Error in Action"<br>#430 "Unknown TerminationID"<br>#431 "No TerminationID matched a wildcard"<br>#432 "Out of TerminationIDs or No TerminationID available"<br>#433 "TerminationID is already in a Context"<br>#434 "Max number of Terminations in a Context exceeded"<br>#435 "Termination ID is not in specified Context"<br>#440 "Unsupported or unknown Package"<br>#441 "Missing Remote or Local Descriptor"<br>#442 "Syntax Error in Command"<br>#443 "Unsupported or Unknown Command"<br>#444 "Unsupported or Unknown Descriptor"<br>#445 "Unsupported or Unknown property"<br>#446 "Unsupported or Unknown Parameter"<br>#447 "Descriptor not legal in this command"<br>#448 "Descriptor appears twice in a command"<br>#449 "Unsupported parameter or property value"<br>#450 "No such property in this package"<br>#451 "No such event in this package"<br>#452 "No such signal in this package"<br>#454 "No such parameter value in this package"<br>#455 "Property illegal in this Descriptor"<br>#456 "Property appears twice in this Descriptor"<br>#457 "Missing parameter in signal or event"<br>#471 "Implied Add for Multiplex failure"<br>#500 "Internal software Failure in MG or MGC"<br>#501 "Not Implemented"<br>#502 "Not ready"<br>#505 "Transaction Request Received before a ServiceChange Reply has been received"<br>#506 "Number of TransactionPendings Exceeded"<br>#510 "Insufficient resources"<br>#511 "Temporarily Busy"<br>#512 "Media Gateway unequipped to detect requested Event"<br>#513 "Media Gateway unequipped to generate requested Signals"<br>#515 "Unsupported Media Type"<br>#517 "Unsupported or invalid mode"<br>#522 "Functionality Requested in Topology Triple Not Supported"<br>#526 "Insufficient bandwidth"<br>#529 "Internal hardware failure in MG"<br>#530 "Temporary Network failure"<br>#531 "Permanent Network failure"<br>#532 "Audited Property, Statistic, Event or Signal does not exist"<br>#533 "Response exceeds maximum transport PDU size"<br>#534 "Illegal write of read only property"<br>#542 "Command is not allowed on this termination" |
| <b>Supported Error Codes defined in packages:</b>   | All error codes defined in supported packages need to be supported.   |
| <b>NOTE:</b> the error codes listed need not be supplied by the TrGW to differentiate each and every error described by |   |

|   |
|---|
| them. The IBCF shall be able to receive the error codes listed. |
|---|

## 5.8 Command API

### 5.8.1 Add

**Table 5.8.1.1: Descriptors used by Add request**

|   |   |
|---|---|
| <b>Descriptors used by Add request:</b> | Media (Stream(LocalControl, Local, Remote)), Event, Signals |
|---|---|

**Table 5.8.1.2: Descriptors used by Add reply**

|                                       |  |
|---------------------------------------|--|
| <b>Descriptors used by Add reply:</b> | Media (Stream (Local)), Error<br><br>When command request excludes an Audit Descriptor, the MGW response shall only include descriptors which contained underspecified or overspecified properties in the command request. Furthermore, only those properties that were underspecified or overspecified in the request shall be sent in the reply. Exceptions to this rule are: <ul style="list-style-type: none"> <li>- The Error Descriptor</li> <li>- SDP properties returned in "Reserve TrGW Connection Point" and "Reserve and Configure TrGW Connection Point" procedures, as specified in 15.17.2.2 and 15.17.2.4</li> </ul> |
|---------------------------------------|--|

### 5.8.2 Modify

**Table 5.8.2.1: Descriptors used by Modify request**

|  |  |
|--|--|
| <b>Descriptors used by Modify request:</b> | Media (TerminationState, Stream (LocalControl, Local, Remote)), Signals, Event |
|--|--|

**Table 5.8.2.2: Descriptors used by Modify reply**

|  |  |
|--|--|
| <b>Descriptors used by Modify reply:</b> | Media (Stream(Local)), Error<br><br>When command request excludes an Audit Descriptor, the MGW response shall only include descriptors which contained underspecified or overspecified properties in the command request. Furthermore, only those properties that were underspecified or overspecified in the request shall be sent in the reply. Exceptions to this rule are: <ul style="list-style-type: none"> <li>- The Error Descriptor</li> <li>- SDP properties returned in "Configure TrGW Connection Point" procedure as specified in 15.17.2.3.</li> </ul> |
|--|--|

### 5.8.3 Subtract

**Table 5.8.3.1: Descriptors used in Subtract request**

|   |                      |
|---|----------------------|
| <b>Descriptors used by Subtract request:</b>                | None or Audit() NOTE |
| NOTE: this is to explicitly avoid reporting any statistics. |                      |

**Table 5.8.3.2: Descriptors used in Subtract reply**

|  |             |
|--|-------------|
| <b>Descriptors used by Subtract reply:</b> | None, Error |
|--|-------------|

### 5.8.4 Move

**Table 5.8.4.1: Command Move**

|                           |    |
|---------------------------|----|
| <b>Move command used:</b> | No |
|---------------------------|----|

**Table 5.8.4.2: Descriptor used by Move command**

|  |   |
|--|---|
| <b>Descriptors used by Move Request:</b> | - |
| <b>Descriptors used by Move Reply:</b>   | - |

### 5.8.5 AuditValue

**Table 5.8.5.1: Descriptors used by AuditValue**

| <b>Audited Properties:</b>     | <b>Property Name and Identity</b>          | <b>Descriptor</b>           |
|--------------------------------|--|-----------------------------|
|                                | Base root properties:<br>- root/* (ROOT)   | TerminationState Descriptor |
|                                | TerminationState:<br>- Root (MGW Audit)    | TerminationState Descriptor |
|                                | For Packages:<br>- Root                    | Packages Descriptor         |
|                                | None (MGW Audit) :<br>- Root               | Audit (empty) Descriptor    |
|                                | IP Realm Availability :<br>- ipra/* (ROOT) | TerminationState Descriptor |
| <b>Audited Statistics:</b>     | None                                       |                             |
| <b>Audited Signals:</b>        | None                                       |                             |
| <b>Audited Events:</b>         | None                                       |                             |
| <b>Package Audit possible:</b> | Yes  |                             |

### 5.8.6 AuditCapabilities

**Table 5.8.6.1: AuditCapabilities**

| <b>Audited Properties:</b> | <b>Property Name and Identity</b> | <b>Descriptor</b> |
|----------------------------|-----------------------------------|-------------------|
|                            | None                              | -                 |
| <b>Audited Statistics:</b> | None                              |                   |
| <b>Audited Signals:</b>    | None                              |                   |
| <b>Audited Events:</b>     | None                              |                   |



**Table 5.8.6.2: Scoped Auditing**

|   |      |
|---|------|
| <b>Audited Properties / ContextAttributes used for a scoped audit :</b> | None |
|---|------|

## 5.8.7 Notify

**Table 5.8.7.1: Descriptors used by Notify**

|  |                |
|--|----------------|
| <b>Descriptors used by Notify Request:</b> | ObservedEvents |
| <b>Descriptors used by Notify Reply:</b>   | None, Error    |
|  |                |

## 5.8.8 ServiceChange

**Table 5.8.8.1: ServiceChangeMethods and ServiceChangeReasons sent by IBCF**

| <b>ServiceChangeMethods Supported:</b>   | <b>ServiceChangeReasons supported:</b>                   |
|--|--|
| Handoff (NOTE 2, NOTE 3)   | "903 MGC Directed Change" (Optional, NOTE 4)             |
| Restart (NOTE 2)   | "901 Cold Boot" (Optional)<br>"902 Warm Boot" (Optional) |
| Forced (NOTE 2)  | "905 Termination Taken Out Of Service" (Optional)        |
| Graceful (NOTE 2)  | "905 Termination Taken Out Of Service" (Optional)        |
| NOTE 1: When a Service Change command on the Root termination with a method other than Graceful is sent, the command shall always be sent as the only command in a message. The sending node shall always wait for the reply to a Service Change command on the Root termination with a method other than Graceful before sending further command requests. A Service Change command on the Root termination with method Graceful may be combined with other commands in a single message. |  |
| NOTE 2: ROOT Only.   |  |
| NOTE 3: Not involving more than 1 IBCF. This does not preclude the use of the MGCIId in a ServiceChange (Handoff) scenario, nor does it change the expected TrGW behaviour upon receipt of such a message, as the TrGW has actually no means to differentiate whether the ServiceChangeMgclid parameter that may be received in a ServiceChange (handoff) message relates to a logical IBCF inside the same IBCF server or is part of another IBCF.  |  |
| NOTE 4: Support of this procedure is mandatory in the TrGW.  |  |

**Table 5.8.8.2: Service Change Methods and Reason sent by TrGW**

| <b>Service Change Methods Supported:</b>   | <b>ServiceChange Reasons supported:</b>  |
|--|--|
| Forced   | "904 Termination Malfunction", ALL except ROOT (Optional, NOTE 4)<br>"905 Termination Taken Out Of Service" , ALL(Mandatory)<br>"906 Loss Of Lower Layer Connectivity" , ALL except ROOT (Optional, NOTE 4)<br>"907 Transmission Failure" , ALL except ROOT (Optional, NOTE 4)<br>"908 MG Impending Failure" ROOT only (Mandatory)<br>"910 Media Capability Failure" , ALL except ROOT (Optional, NOTE 4)<br>"915 State Loss" ROOT only (Optional, NOTE 4) |
| Graceful   | "905 Termination Taken Out Of Service" , (Optional, NOTE 4)<br>"908 MG Impending Failure" (Optional, NOTE 4)   |
| Disconnected (NOTE 1)  | "900 Service Restored" (Mandatory)<br>"916 Packages Change" (Optional)<br>"917 Capability Change" (Optional)   |
| Restart (NOTE 1)   | "900 Service Restored" (Mandatory)<br>"901 Cold Boot" (Mandatory)<br>"902 Warm Boot" (Mandatory)<br>"916 Packages Change" (Optional)<br>"917 Capability Change "(Optional)   |
| Handoff (NOTE 1, NOTE 2)   | "903 MGC Directed Change" (Mandatory)  |
| NOTE 1: When a Service Change command on the Root termination with a method other than Graceful is sent, the command shall always be sent as the only command in a message. The sending node shall always wait for the reply to a Service Change command on the Root termination with a method other than Graceful before sending further command requests. A Service Change command on the Root termination with method Graceful may be combined with other commands in a single message.<br>NOTE 2: ROOT Only.<br>NOTE 3: In response to an IBCF Ordered Re-Register.<br>NOTE 4: Support of this procedure is mandatory in the IBCF. |  |

**Table 5.8.8.3: Service Change Address**

|                                   |    |
|-----------------------------------|----|
| <b>ServiceChangeAddress used:</b> | No |
|-----------------------------------|----|

**Table 5.8.8.4: Service Change Delay**

|                                 |                             |
|---------------------------------|-----------------------------|
| <b>ServiceChangeDelay used:</b> | No                          |
| <i>If yes</i>                   | <b>Valid time period:</b> - |

**Table 5.8.8.5: Service Change Incomplete Flag**

|  |    |
|--|----|
| <b>ServiceChange Incomplete Flag used:</b> | No |
|--|----|

**Table 5.8.8.6: Service Change Version**

|  |        |
|--|--------|
| <b>Version used in ServiceChangeVersion:</b>   | 2 or 3 |
| NOTE: Version 2 shall be supported as the minimum protocol version. See subclause 5.3. |        |

**Table 5.8.8.7: ServiceChangeProfile**

|   |     |
|---|-----|
| <b>ServiceChangeProfile mandatory:</b>  | Yes |
| NOTE: The ServiceChangeProfile is mandatory in the TrGW Register, TrGW Re-Register and TrGW Capability Change procedures. |     |

**Table 5.8.8.8: Profile negotiation**

|   |    |
|---|----|
| <b>Profile negotiation as per H.248.18:</b> | No |
|---|----|

**Table 5.8.8.9: ServiceChangeMGCIId**

|                                  |     |
|----------------------------------|-----|
| <b>ServiceChangeMGCIId used:</b> | Yes |
|----------------------------------|-----|

## 5.8.9 Manipulating and auditing context attributes

**Table 5.8.9.1: Manipulating and Auditing Context Attributes**

|  |   |
|--|---|
| <b>Context Attributes Manipulated:</b> | Emergency Indicator, Priority Indicator |
| <b>Context Attributes Audited:</b>     | None                                    |

## 5.9 Generic command syntax and encoding

**Table 5.9.1: Command Encoding**

|   |   |
|---|---|
| <b>Supported Encodings:</b>   | Text (NOTE 1, NOTE 2, NOTE 3) and Binary. |
| NOTE 1: The receiver shall be capable of receiving both Short Token Notation and Long Token Notation on an H.248 control association. |   |
| NOTE 2: The transmitter may select between long and short token forms per H.248 control association.                                  |   |
| NOTE 3: ETSI TISPAN "Ia Profile" [4] uses only text encoding.   |   |

## 5.10 Transactions

**Table 5.10.1: Transactions**

|  |           |
|--|-----------|
| <b>Maximum number of Transaction Requests / Replies / TransResponseAcks / Segment Replies per message:</b> | 10 (NOTE) |
| NOTE: ETSI TISPAN "Ia Profile" [4] maximum is "1", this is foreseen to be the typical case                 |           |

**Table 5.10.2: Commands per Transaction Request**

|  |                    |
|--|--------------------|
| <b>Maximum number of commands per Transaction request:</b>                                 | Unspecified (NOTE) |
| NOTE: ETSI TISPAN "Ia Profile" [4] maximum is "2", this is foreseen to be the typical case |                    |

**Table 5.10.3: Commands per Transaction Reply**

|  |                    |
|--|--------------------|
| <b>Maximum number of commands per Transaction reply:</b>                                   | Unspecified (NOTE) |
| NOTE: ETSI TISPAN "Ia Profile" [4] maximum is "2", this is foreseen to be the typical case |                    |

**Table 5.10.4: Optional Commands**

|  |     |
|--|-----|
| <b>Commands able to be marked "Optional":</b>  | ALL |
| NOTE: The meaning of this table is that if one of the listed commands failed then the possibly present subsequent command within the same transaction will be processed. |     |

**Table 5.10.5: Commands marked for Wildcarded Responses**

|   |          |
|---|----------|
| <b>Wildcarded responses may be requested for:</b> | Subtract |
|---|----------|

**Table 5.10.6: Procedures for Wildcarded Responses**

|  |                          |
|--|--------------------------|
| <b>Procedures that make use of wildcarded responses:</b> | Release TrGW Termination |
|--|--------------------------|

**Table 5.10.7: Transaction Timers**

| <b>Transaction Timer:</b>               | <b>Value</b> |
|---|--------------|
| <b>NormalMGExecutionTime</b>            | Provisioned  |
| <b>NormalMGCEExecutionTime</b>          | Provisioned  |
| <b>MGOriginatedPendingLimit</b>         | Provisioned  |
| <b>MGCOriginatedPendingLimit</b>        | Provisioned  |
| <b>MGProvisionalResponseTimerValue</b>  | Provisioned  |
| <b>MGCProvisionalResponseTimerValue</b> | Provisioned  |

## 5.11 Messages

It is recommended that TrGW and IBCF names are in the form of fully qualified domain name. For example the domain name of the IBCF may be of the form: "IBCF1.whatever.net." and the name of the TrGW may be of the form: "TrGW1.whatever.net."

The fully qualified domain name will be used by the TrGW and IBCF as part of the "Message Identifier" in the H.248 messages which identifies the originator of the message.

The IBCF domain name is provisioned in the TrGW or retrieved from the DNS using SRV records.

The use of a domain name provides the following benefits:

- TrGWs and IBCFs are identified by their domain name, not their network addresses. Several addresses can be associated with a domain name. If a command cannot be forwarded to one of the network addresses, implementations shall retry the transmission using another address.

NOTE: There are then e.g. multiple numerical address entries per single MGC entity in the "MG database of MGC entries"; see Table 5 in ITU-T H.Sup7 [24].

- TrGWs and IBCFs may move to another platform. The association between a logical name (domain name) and the actual platform are kept in the Domain Name Service (DNS). TrGW and IBCF shall keep track of the record's time-to-live read from the DNS. They shall query the DNS to refresh the information if the time-to-live has expired.

The domain name may be used by IBCF/TrGW for authentication purposes.

## 5.12 Transport

**Table 5.12.1: Transport**

|  |  |
|--|--|
| <b>Supported Transports:</b>   | <ol style="list-style-type: none"> <li>1. IPv4-based network control plane: <ul style="list-style-type: none"> <li>• SCTP/IPv4 (Recommended) NOTE1</li> <li>• UDP/IPv4 (Optional)</li> </ul> </li> <li>2. IPv6-based network control plane: <ul style="list-style-type: none"> <li>• SCTP/IPv6 (Recommended) NOTE1</li> <li>• UDP/IPv6 (Optional)</li> </ul> </li> </ol> |
| NOTE1: When using SCTP as defined in IETF RFC 4960 [26] the TrGW shall always be the node to perform the "Initiation". |  |

**Table 5.12.2: Segmentation**

|                                |  |
|--------------------------------|--|
| <b>Segmentation Supported:</b> | SCTP: Inherent in Transport<br>UDP: No |
|--------------------------------|--|

**Table 5.12.3: Control Association**

|  |   |
|--|---|
| <b>Control Association Monitoring Supported:</b> | Monitoring mechanism is dependent on used H.248 transport (see above table 5.12.1):<br><b>SCTP:</b><br>inherent capability of SCTP.<br><b>UDP:</b><br>H.248.14 (MG-driven monitoring).<br>Empty AuditValue on ROOT (MGC-driven monitoring). |
|--|---|

## 5.13 Security

**Table 5.13.1: Security**

|                            |  |
|----------------------------|--|
| <b>Supported Security:</b> | None   |
| NOTE:                      | IPsec shall not be used by the IBCF or TrGW for the Ix interface. Normally the Ix interface lies within a single operator's secure domain. If this is not the case then a Za interface (Security Gateway deploying IPsec) may be required, however this is a separate logical function/entity and thus is not applicable to the Ix profile, the IBCF or the TrGW; for further details see 3GPP TS 33.210 [22]. |

## 5.14 Packages

### 5.14.1 Mandatory Packages

**Table 5.14.1.1: Mandatory Packages**

| <b>Mandatory Packages</b>   |                       |                |
|---|-----------------------|----------------|
| <b>Package Name</b>   | <b>Package ID</b>     | <b>Version</b> |
| Generic (ITU-T Recommendation H.248.1 [3], annex E.1)   | g, (0x0001)           | 1              |
| Base root (ITU-T Recommendation H.248.1 [3], annex E.2)   | root, (0x0051)        | 2              |
| RTP Control Protocol Package (ITU-T Recommendation H.248.57 [5])                                    | rtcph, (0x00b5)       | 1              |
| Gate management Source Address/Port Filtering Package (ITU-T Recommendation H.248.43, Clause 7 [6]) | gm, (0x008c)          | 2              |
| Traffic management (ITU-T Recommendation H.248.53 [13])   | tman, (0x008d)        | 1              |
| IP Domain Connection (ITU-T Recommendation H.248.41 [14])   | ipdc, (0x009d)        | 1              |
| Hanging Termination Detection (ITU-T Recommendation H.248.36 [15])                                  | hangterm,<br>(0x0098) | 1              |
| Diffserv (ITU-T Recommendation H.248.52 [12])   | ds, (0x008b)          | 2              |

## 5.14.2 Optional Packages

**Table 5.14.2.1: Optional Packages**

| Optional Packages   |                   |         |  |
|---|-------------------|---------|--|
| Package Name  | Package ID        | Version | Support dependent on   |
| Inactivity Timer (ITU-T Recommendation H.248.14 [19])   | it, (0x0045)      | 1       | MGC polling by MG.<br>Only applicable for UDP transport.   |
| Media Gateway Overload Control (ITU-T Recommendation H.248.11 [16])                                   | ocp, (0x0051)     | 1       | Support of message throttling, based on rate limitation, from MGC towards MG.  |
| Media Gateway Resource Congestion Handling Package (see ITU-T Recommendation H.248.10 [20])           | chp, (0x0029)     | 1       | Support of message throttling, based on percentage limitation, from MGC towards MG.  |
| IP realm availability (ITU-T Recommendation H.248.41 Amendment 1 [14])                                | ipra (0x00e0)     | 1       | Support of mechanisms allowing the MGC to discover the IP realms that are available at the MG at a certain time and allowing the MG to inform the MGC about any changes in the availability of realms. |
| 3G Interface Type package (see subclause 15.2.11 of 3GPP TS 29.232 [21])                              | thregint (0x00e3) | 1       | Indication of interface type for statistical purposes at the MG.   |
| Application Data Inactivity Detection (ITU-T Recommendation H.248.40 [27])                            | adid (0x009c)     | 1       | MGC requires to be explicitly informed of a cessation of an application data flow.   |
| Explicit Congestion Notification for RTP-over-UDP Support (ITU-T Recommendation H.248.82 see Annex B) | ecnrous (0x010b)  | 1       | Support of ECN feature   |

## 5.14.3 Package usage information

## 5.14.3.1 Generic (g)

Table 5.14.3.1.1: Generic package

| Properties                               | Mandatory/Optional              | Used in command  | Supported Values        | Provisioned Value                 |
|--|---------------------------------|--|-------------------------|-----------------------------------|
| None                                     | -                               | -  | -                       | -                                 |
| <b>Signals</b>                           | <b>Mandatory/Optional</b>       | <b>Used in command</b>   |                         | <b>Duration Provisioned Value</b> |
| None                                     | -                               | -  |                         | -                                 |
|  | <b>Signal Parameters</b>        | <b>Mandatory/Optional</b>  | <b>Supported Values</b> | <b>Duration Provisioned Value</b> |
|  | -                               | -  | -                       | -                                 |
| <b>Events</b>                            | <b>Mandatory/Optional</b>       | <b>Used in command</b>   |                         |                                   |
| Cause (g/cause, 0x0001/0x0001)           | M                               | ADD, MOD, NOTIFY   |                         |                                   |
|  | <b>Event Parameters</b>         | <b>Mandatory/Optional</b>  | <b>Supported Values</b> | <b>Provisioned Value</b>          |
|  | None                            | -  | -                       | -                                 |
|  | <b>ObservedEvent Parameters</b> | <b>Mandatory/Optional</b>  | <b>Supported Values</b> | <b>Provisioned Value</b>          |
| General cause (Generalcause, 0x0001)     | M                               | "NR" (0x0001)<br>Normal Release<br>"UR" (0x0002)<br>Unavailable Resources<br>"FT" (0x0003)<br>Failure, Temporary<br>"FP" (0x0004)<br>Failure, Permanent<br>"IW" (0x0005)<br>Interworking Error<br>"UN" (0x0006)<br>Unsupported | Not Applicable          |                                   |
| Failure cause (Failurecause, 0x0002)     | O                               | Octet String   | Not Applicable          |                                   |
| <b>Events</b>                            | <b>Mandatory/Optional</b>       | <b>Used in command</b>   |                         |                                   |
| Signal Completion. (g/sc, 0x0001/0x0002) | Not Used                        | -  |                         |                                   |
|  | <b>Event Parameters</b>         | <b>Mandatory/Optional</b>  | <b>Supported Values</b> | <b>Provisioned Value</b>          |
|  | -                               | -  | -                       | -                                 |
|  | <b>ObservedEvent Parameters</b> | <b>Mandatory/Optional</b>  | <b>Supported Values</b> | <b>Provisioned Value</b>          |
|  | -                               | -  | -                       | -                                 |
| <b>Statistics</b>                        | <b>Mandatory/Optional</b>       | <b>Used in command</b>   | <b>Supported Values</b> |                                   |
| None                                     | -                               | -  | -                       |                                   |
| <b>Error Codes</b>                       | <b>Mandatory/Optional</b>       |  |                         |                                   |
| None                                     | -                               |  |                         |                                   |

## 5.14.3.2 Base root (root)

Table 5.14.3.2.1: Base root package

| Properties   | Mandatory/Optional       | Used in command    | Supported Values | Provisioned Value          |
|--|--------------------------|--------------------|------------------|----------------------------|
| MaxNrOfContexts<br>(root/maxNumberOfContexts, 0x0002/0x0001)                               | O                        | AUDITVALUE         | ALL              | YES                        |
| MaxTerminationsPerContext<br>(root/maxTerminationPerContext, 0x0002/0x0002)                | O                        | AUDITVALUE         | ALL              | YES                        |
| normalMGExecutionTime<br>(root/normalMGExecutionTime, 0x0002/0x0003)                       | O                        | AUDITVALUE         | ALL              | YES                        |
| normalMGCEExecutionTime<br>(root/normalMGCEExecutionTime, 0x0002/0x0004)                   | O                        | AUDITVALUE         | ALL              | YES                        |
| MGProvisionalResponseTimerValue<br>(root/MGProvisionalResponseTimerValue, 0x0002/0x0005)   | O                        | AUDITVALUE         | ALL              | YES                        |
| MGCProvisionalResponseTimerValue<br>(root/MGCProvisionalResponseTimerValue, 0x0002/0x0006) | O                        | AUDITVALUE         | ALL              | YES                        |
| MGCOriginatedPendingLimit<br>(root/MGCOriginatedPendingLimit, 0x0002/0x0007)               | O                        | AUDITVALUE         | ALL              | YES                        |
| MGOOriginatedPendingLimit<br>(root/MGOOriginatedPendingLimit, 0x0002/0x0008)               | O                        | AUDITVALUE         | ALL              | YES                        |
| Signals  | Mandatory/Optional       | Used in command    |                  | Duration Provisioned Value |
| None   | -                        | -                  |                  | -                          |
|  | Signal Parameters        | Mandatory/Optional | Supported Values | Duration Provisioned Value |
|  | -                        | -                  | -                | -                          |
| Events   | Mandatory/Optional       | Used in command    |                  |                            |
| None   | -                        | -                  |                  |                            |
|  | Event Parameters         | Mandatory/Optional | Supported Values | Provisioned Value          |
|  | -                        | -                  | -                | -                          |
|  | ObservedEvent Parameters | Mandatory/Optional | Supported Values | Provisioned Value          |
| -  | -                        | -                  | -                | -                          |
| Statistics   | Mandatory/Optional       | Used in command    |                  | Supported Values           |
| None   | -                        | -                  |                  | -                          |
| Error Codes  | Mandatory/Optional       |                    |                  |                            |
| None   | -                        |                    |                  |                            |



## 5.14.3.3 Differentiated Services (ds)

Table 5.14.3.3.1: Differentiated Services package

| Properties  | Mandatory/Optional       | Used in command    | Supported Values | Provisioned Value          |
|---|--------------------------|--------------------|------------------|----------------------------|
| Differentiated Services Code Point (ds/dscp, 0x008b/0x0001) | M                        | ADD, MODIFY        | ALL              | Yes                        |
| Tagging Behaviour (ds/tb, 0x008b/0x0002)                    | O                        | ADD, MODIFY        | ALL              | Yes                        |
| Signals   | Mandatory/Optional       | Used in command    |                  | Duration Provisioned Value |
| None  | -                        | -                  |                  | -                          |
|   | Signal Parameters        | Mandatory/Optional | Supported Values | Duration Provisioned Value |
|   | -                        | -                  | -                | -                          |
| Events  | Mandatory/Optional       | Used in command    |                  |                            |
| None  | -                        | -                  |                  |                            |
|   | Event Parameters         | Mandatory/Optional | Supported Values | Provisioned Value          |
|   | -                        | -                  | -                | -                          |
|   | ObservedEvent Parameters | Mandatory/Optional | Supported Values | Provisioned Value          |
| -   | -                        | -                  | -                | -                          |
| Statistics  | Mandatory/Optional       | Used in command    | Supported Values |                            |
| None  | -                        | -                  | -                |                            |
| Error Codes   | Mandatory/Optional       |                    |                  |                            |
| None  | -                        |                    |                  |                            |

## 5.14.3.4 Gate Management (gm)

Table 5.14.3.4.1: Gate Management Package

| Properties   | Mandatory/Optional       | Used in command    | Supported Values | Provisioned Value          |
|--|--------------------------|--------------------|------------------|----------------------------|
| Remote Source Address Filtering<br>(gm/saf,0x008c/0x0001)  | M                        | ADD, MODIFY        | ALL              | Not Applicable             |
| Remote Source Address Mask<br>(gm/sam,0x008c/0x0002)   | O                        | ADD, MODIFY        | ALL              | Not Applicable             |
| Remote Source Port Filtering<br>(gm/spf,0x008c/0x0003)   | M                        | ADD, MODIFY        | ALL              | Not Applicable             |
| Remote Source Port<br>(gm/spr,0x008c/0x0004)   | O                        | ADD, MODIFY        | ALL              | Not Applicable             |
| Explicit Source Address Setting<br>(gm/esas,0x008c/0x0005)   | Not Supported            | NONE               | -                | -                          |
| Local Source Address<br>(gm/lsa,0x008c/0x0006)   | Not Supported            | NONE               | -                | -                          |
| Explicit Source Port Setting<br>(gm/esps,0x008c/0x0007)  | Not Supported            | NONE               | -                | -                          |
| Local Source Port<br>(gm/lsp,0x008c/0x0008)  | Not Supported            | NONE               | -                | -                          |
| Remote Source Port Range<br>(gm/spr,0x008c/0x000A)   | O                        | ADD, MODIFY        | ALL              | Not Applicable             |
|  |                          |                    |                  |                            |
| Signals  | Mandatory/Optional       | Used in command    |                  | Duration Provisioned Value |
| None   | -                        | -                  |                  | -                          |
|  | Signal Parameters        | Mandatory/Optional | Supported Values | Duration Provisioned Value |
|  | -                        | -                  | -                | -                          |
| Events   | Mandatory/Optional       | Used in command    |                  |                            |
| None   | -                        | -                  |                  |                            |
|  | Event Parameters         | Mandatory/Optional | Supported Values | Provisioned Value          |
|  | -                        | -                  | -                | -                          |
|  | ObservedEvent Parameters | Mandatory/Optional | Supported Values | Provisioned Value          |
|  | -                        | -                  | -                | -                          |
| Statistics   | Mandatory/Optional       | Used in command    | Supported Values |                            |
| Discarded Packets<br>(gm/dp,0x008c/0x0001)   | Not Supported            | None               | -                |                            |
| Error Codes  | Mandatory/Optional       |                    |                  |                            |
| None   | -                        |                    |                  |                            |
| NOTE : This package extends RTP Control Protocol package (ITU-T Recommendation H.248.57 [5]) and thus inherits RTCP Allocation Specific Behaviour property ( <i>rsb</i> ). |                          |                    |                  |                            |

## 5.14.3.5 Traffic management (tman)

Table 5.14.3.5.1: Traffic Management Package

| Properties  | Mandatory/Optional       | Used in command    | Supported Values | Provisioned Value          |
|---|--------------------------|--------------------|------------------|----------------------------|
| Policing (tman/pol, 0x008d/0x0005)                  | M                        | ADD, MODIFY        | ALL              | Not Applicable             |
| Peak Data Rate (tman/pdr, 0x008d/0x0001)            | O                        | ADD, MODIFY        | ALL              | Not Applicable             |
| Delay Variation Tolerance (tman/dvt, 0x008d/0x0004) | O                        | ADD, MODIFY        | ALL              | ANY                        |
| Sustainable Data Rate (tman/sdr, 0x008d/0x0002)     | M                        | ADD, MODIFY        | ALL              | Not Applicable             |
| Maximum burst size (tman/mbs, 0x008d/0x0003)        | M                        | ADD, MODIFY        | ALL              | Not Applicable             |
| Signals   | Mandatory/Optional       | Used in command    |                  | Duration Provisioned Value |
| None  | -                        | -                  |                  | -                          |
|   | Signal Parameters        | Mandatory/Optional | Supported Values | Duration Provisioned Value |
|   | -                        | -                  | -                | -                          |
| Events  | Mandatory/Optional       | Used in command    |                  |                            |
| None  | -                        | -                  |                  |                            |
|   | Event Parameters         | Mandatory/Optional | Supported Values | Provisioned Value          |
|   | -                        | -                  | -                | -                          |
|   | ObservedEvent Parameters | Mandatory/Optional | Supported Values | Provisioned Value          |
| -   | -                        | -                  | -                | -                          |
| Statistics  | Mandatory/Optional       | Used in command    | Supported Values |                            |
| None  | -                        | -                  | -                |                            |
| Error Codes   | Mandatory/Optional       |                    |                  |                            |
| None  | -                        |                    |                  |                            |

NOTE: The data rate shall be calculated using the packet size from IP layer upwards. The Token Bucket method as described by ITU-T Recommendation H.248.53 [13] sub-clause 9.4.3 (as per IETF RFC 2216 [32]) shall be followed where SDR = "r" and MBS = "b" (i.e. the additional "M" value does not apply).

## 5.14.3.6 Inactivity Timer (it)

Table 5.14.3.6.1: Inactivity Timer Package

| Properties                                 | Mandatory/Optional                    | Used in command    | Supported Values | Provisioned Value          |
|--|---------------------------------------|--------------------|------------------|----------------------------|
| None                                       | -                                     | -                  | -                | -                          |
| Signals                                    | Mandatory/Optional                    | Used in command    |                  | Duration Provisioned Value |
| None                                       | -                                     | -                  | -                | -                          |
|  | Signal Parameters                     | Mandatory/Optional | Supported Values | Duration Provisioned Value |
|  | -                                     | -                  | -                | -                          |
| Events                                     | Mandatory/Optional                    | Used in command    |                  |                            |
| Inactivity Timeout (it/ito, 0x0045/0x0001) | M                                     | MODIFY, NOTIFY     |                  |                            |
|  | Event Parameters                      | Mandatory/Optional | Supported Values | Provisioned Value          |
|  | Maximum Inactivity Time (mit, 0x0001) | O                  | ALL              | Yes                        |
|  | ObservedEvent Parameters              | Mandatory/Optional | Supported Values | Provisioned Value          |
|  | None                                  | -                  | -                | -                          |
| Statistics                                 | Mandatory/Optional                    | Used in command    | Supported Values |                            |
| None                                       | -                                     | -                  | -                |                            |
| Error Codes                                | Mandatory/Optional                    |                    |                  |                            |
| None                                       | -                                     |                    |                  |                            |

## 5.14.3.7 IP Domain Connection (ipdc)

Table 5.14.3.7.1: IP domain connection package

| Properties  | Mandatory/Optional       | Used in command      | Supported Values | Provisioned Value          |
|---|--------------------------|----------------------|------------------|----------------------------|
| IP Realm Identifier (ipdc/realm, 0x009d/0x0001)   | M                        | ADD, MODIFY (NOTE 2) | ALL (NOTE 1)     | Yes                        |
| Signals   | Mandatory/Optional       | Used in command      |                  | Duration Provisioned Value |
| None  | -                        | -                    |                  | -                          |
|   | Signal Parameters        | Mandatory/Optional   | Supported Values | Duration Provisioned Value |
|   | -                        | -                    | -                | -                          |
| Events  | Mandatory/Optional       | Used in command      |                  |                            |
| None  | -                        | -                    |                  |                            |
|   | Event Parameters         | Mandatory/Optional   | Supported Values | Provisioned Value          |
|   | -                        | -                    | -                | -                          |
|   | ObservedEvent Parameters | Mandatory/Optional   | Supported Values | Provisioned Value          |
|   | -                        | -                    | -                | -                          |
| Statistics  | Mandatory/Optional       | Used in command      | Supported Values |                            |
| None  | -                        | -                    | -                |                            |
| Error Codes   | Mandatory/Optional       |                      |                  |                            |
| No  | -                        |                      |                  |                            |
| NOTE 1: If the MGC uses an <i>ipdc/realm</i> property exceeding the length limitation defined in ITU-T Recommendation H.248.41 [14], the MG shall reply with an error descriptor using error code #410: "Incorrect identifier".   |                          |                      |                  |                            |
| NOTE 2: The MODIFY command is listed due to the ETSI TISPAN "Ia profile" [4]: subsequent Streams may be "added" by MODIFY requests in case of multi-Stream-per-Termination structures. The subsequent Streams do then carry the same <i>ipdc/realm</i> property value as the very first Stream. |                          |                      |                  |                            |

## 5.14.3.8 Media Gateway Overload Control Package (ocp)

Table 5.14.3.8.1: Media Gateway Overload Control Package

| Properties   | Mandatory/Optional       | Used in command         | Supported Values | Provisioned Value          |
|--|--------------------------|-------------------------|------------------|----------------------------|
| None   | -                        | -                       | -                | -                          |
| Signals  | Mandatory/Optional       | Used in command         |                  | Duration Provisioned Value |
| None   | -                        | -                       | -                | -                          |
|  | Signal Parameters        | Mandatory/Optional      | Supported Values | Duration Provisioned Value |
|  | -                        | -                       | -                | -                          |
| Events   | Mandatory/Optional       | Used in command         |                  |                            |
| MG_Overload<br>(ocp/mg_overload,<br>0x0051/0x0001)<br>(NOTE 1)   | M                        | MODIFY, NOTIFY (NOTE 1) |                  |                            |
|  | Event Parameters         | Mandatory/Optional      | Supported Values | Provisioned Value          |
|  | None                     | -                       | -                | -                          |
|  | ObservedEvent Parameters | Mandatory/Optional      | Supported Values | Provisioned Value          |
|  | None                     | -                       | -                | -                          |
| Statistics   | Mandatory/Optional       | Used in command         | Supported Values |                            |
| None   | -                        | -                       | -                |                            |
| Error Codes  | Mandatory/Optional       |                         |                  |                            |
| None   | -                        |                         |                  |                            |
| NOTE 1 When the MG is overloaded, overload Events may be sent <b>either</b> only following the <b>first ADD.request</b> which creates a new Context, <b>or</b> following <b>all ADD.request</b> commands (see ITU-T Recommendation H.248.11 [16] Corrigendum 1).<br>These two options result in different normalisations of the overload event rate as an indicator of the level of MG overload. |                          |                         |                  |                            |

## 5.14.3.9 Hanging Termination Detection (hangterm)

Table 5.14.3.9.1: Hanging Termination Detection Package

| Properties  | Mandatory/Optional         | Used in command     | Supported Values | Provisioned Value          |
|---|----------------------------|---------------------|------------------|----------------------------|
| None  | -                          | -                   | -                | -                          |
| Signals   | Mandatory/Optional         | Used in command     |                  | Duration Provisioned Value |
| None  | -                          | -                   | -                | -                          |
|   | Signal Parameters          | Mandatory/Optional  | Supported Values | Duration Provisioned Value |
|   | -                          | -                   | -                | -                          |
| Events  | Mandatory/Optional         | Used in command     |                  |                            |
| Termination Heartbeat<br>(hangterm/thb,<br>0x0098/0x0001)   | M                          | ADD, MODIFY, NOTIFY |                  |                            |
|   | Event Parameters           | Mandatory/Optional  | Supported Values | Provisioned Value          |
|   | Timer X<br>(timerx,0x0001) | M (NOTE1)           | ALL (NOTE2)      | YES                        |
|   | ObservedEvent Parameters   | Mandatory/Optional  | Supported Values | Provisioned Value          |
|   | -                          | -                   | -                | -                          |
| Statistics  | Mandatory/Optional         | Used in command     | Supported Values |                            |
| None  | -                          | -                   | -                |                            |
| Error Codes   | Mandatory/Optional         |                     |                  |                            |
| None  | -                          |                     |                  |                            |
| NOTE1: Timer X is optional in the ETSI TISPA N la version 3 profile [4].<br>NOTE2: The heartbeat timer shall be configured to a value much greater than the mean call holding time. |                            |                     |                  |                            |

## 5.14.3.10 Media Gateway Resource Congestion handling Package (chp)

Table 5.14.3.10.1: Media Gateway Resource Congestion handling Package

| Properties                             | Mandatory/Optional              | Used in command    | Supported Values | Provisioned Value          |
|--|---------------------------------|--------------------|------------------|----------------------------|
| None                                   | -                               | -                  | -                | -                          |
| Signals                                | Mandatory/Optional              | Used in command    |                  | Duration Provisioned Value |
| None                                   | -                               | -                  | -                | -                          |
|  | Signal Parameters               | Mandatory/Optional | Supported Values | Duration Provisioned Value |
|  | -                               | -                  | -                | -                          |
| Events                                 | Mandatory/Optional              | Used in command    |                  |                            |
| MGCon<br>(chp/mgcon,<br>0x0029/0x0001) | M                               | MODIFY, NOTIFY     |                  |                            |
|  | Event Parameters                | Mandatory/Optional | Supported Values | Provisioned Value          |
|  | None                            | -                  | -                | -                          |
|  | ObservedEvent Parameters        | Mandatory/Optional | Supported Values | Provisioned Value          |
|  | Reduction<br>(reduction,0x0001) | M                  | 0-100            | Not Applicable             |
| Statistics                             | Mandatory/Optional              | Used in command    | Supported Values |                            |
| None                                   | -                               | -                  | -                |                            |
| Error Codes                            | Mandatory/Optional              |                    |                  |                            |
| None                                   | -                               |                    |                  |                            |

## 5.14.3.11 IP Realm Availability (ipra)

Table 5.14.3.11.1: IP Realm Availability Package

| Properties  | Mandatory/Optional                           | Used in command    | Supported Values  | Provisioned Value          |
|---|--|--------------------|-------------------|----------------------------|
| Available Realms,<br>(ipra/ar,<br>0x00e0/0x0001)          | M  | AUDITVALUE         | ALL               | Not Applicable             |
| Signals   | Mandatory/Optional                           | Used in command    |                   | Duration Provisioned Value |
| None  | -  | -                  |                   | -                          |
|   | Signal Parameters                            | Mandatory/Optional | Supported Values  | Duration Provisioned Value |
|   | -  | -                  | -                 | -                          |
| Events  | Mandatory/Optional                           | Used in command    |                   |                            |
| Available Realms<br>Changed, (ipra/arc,<br>0x00e0/0x0001) | M  | MODIFY, NOTIFY     |                   |                            |
|   | Event Parameters                             | Mandatory/Optional | Supported Values: | Provisioned Value          |
|   | -  | -                  | -                 | -                          |
|   | ObservedEvent Parameters                     | Mandatory/Optional | Supported Values  | Provisioned Value          |
|   | Newly Available<br>Realms (nar,<br>0x0001)   | M                  | ALL               | Not applicable             |
|   | Newly Unavailable<br>Realms (nur,<br>0x0002) | M                  | ALL               | Not applicable             |
| Statistics  | Mandatory/Optional                           | Used in command    | Supported Values  |                            |
| None  | -  | -                  | -                 |                            |
| Error Codes   | Mandatory/Optional                           |                    |                   |                            |
| None  | -  |                    |                   |                            |

## 5.14.3.12 3G Interface Type package (threegint)

Table 5.14.3.12.1: 3G Interface Type Package

| Properties   | Mandatory/Optional          | Used in command    | Supported Values  | Provisioned Value             |
|--|-----------------------------|--------------------|---|-------------------------------|
| IP Interface Type<br>(threegint /ipint,<br>(0x00e3/0x0001) | M                           | ADD, MOD           | "NboIP" (0x0001)<br>"MboIP" (0x0003)<br>"ExtSIP" (0x0004) | None                          |
| Signals  | Mandatory/Optional          | Used in command    |   | Duration<br>Provisioned Value |
| None   | -                           | -                  |   | -                             |
|  | Signal Parameters           | Mandatory/Optional | Supported Values  | Duration<br>Provisioned Value |
|  | -                           | -                  | -   | -                             |
| Events   | Mandatory/Optional          | Used in command    |   |                               |
| None   | -                           | -                  |   |                               |
|  | Event Parameters            | Mandatory/Optional | Supported Values  | Provisioned Value             |
|  | -                           | -                  | -   | -                             |
|  | ObservedEvent<br>Parameters | Mandatory/Optional | Supported Values  | Provisioned Value             |
| -  | -                           | -                  | -   | -                             |
| Statistics   | Mandatory/Optional          | Used in command    | Supported Values  |                               |
| None   | -                           | -                  | -   |                               |
| Error Codes  | Mandatory/Optional          |                    |   |                               |
| None   | -                           |                    |   |                               |

## 5.14.3.13 RTCP Handling Package (rtcph)

Table 5.14.3.13.1: RTCP Handling Package

| Properties  | Mandatory/Optional          | Used in command        | Supported Values    | Provisioned Value                |
|---|-----------------------------|------------------------|---------------------|----------------------------------|
| RTCP Allocation Specific Behaviour<br>(rtcph/rsb,0x00b5/0x0009) | M                           | ADD, MODIFY            | ALL                 | OFF                              |
| Signals   | Mandatory/Optional          | Used in command        |                     | Duration<br>Provisioned Value    |
| None  | -                           | -                      |                     | -                                |
|   | Signal Parameters           | Mandatory/<br>Optional | Supported<br>Values | Duration<br>Provisioned<br>Value |
|   | -                           | -                      | -                   | -                                |
| Events  | Mandatory/Optional          | Used in command        |                     |                                  |
| None  | -                           | -                      |                     |                                  |
|   | Event Parameters            | Mandatory/<br>Optional | Supported<br>Values | Provisioned<br>Value             |
|   | -                           | -                      | -                   | -                                |
|   | ObservedEvent<br>Parameters | Mandatory/<br>Optional | Supported<br>Values | Provisioned<br>Value             |
| -   | -                           | -                      | -                   | -                                |
| Statistics  | Mandatory/Optional          | Used in command        | Supported Values    |                                  |
| None  | -                           | -                      | -                   |                                  |
| Error Codes   | Mandatory/Optional          |                        |                     |                                  |
| None  | -                           |                        |                     |                                  |

## 5.14.3.14 Application Data Inactivity Detection (adid)

Table 5.14.3.14.1: Application Data Inactivity Detection package

| Properties  | Mandatory/Optional         | Used in command     | Supported Values | Provisioned Value          |
|---|----------------------------|---------------------|------------------|----------------------------|
| None  | -                          | -                   | -                | -                          |
| Signals   | Mandatory/Optional         | Used in command     |                  | Duration Provisioned Value |
| None  | -                          | -                   |                  | -                          |
|   | Signal Parameters          | Mandatory/Optional  | Supported Values | Duration Provisioned Value |
|   | -                          | -                   | -                | -                          |
| Events  | Mandatory/Optional         | Used in command     |                  |                            |
| IP Flow Stop Detection (adid/ipstop, 0x009c/0x0001) | M                          | ADD, MODIFY, NOTIFY |                  |                            |
|   | Event Parameters           | Mandatory/Optional  | Supported Values | Provisioned Value          |
|   | Detection time (dt,0x0001) | M                   | ALL              | Yes                        |
|   | Direction (dir, 0x002)     | M                   | ALL              | Yes                        |
|   | ObservedEvent Parameters   | Mandatory/Optional  | Supported Values | Provisioned Value          |
|   | -                          | -                   | -                | -                          |
| Statistics  | Mandatory/Optional         | Used in command     | Supported Values |                            |
| None  | -                          | -                   | -                |                            |
| Error Codes   | Mandatory/Optional         |                     |                  |                            |
| None  | -                          |                     |                  |                            |



## 5.14.3.15 Explicit Congestion Notification for RTP-over-UDP Support (ecnrous)

Table 5.14.3.15.1: Explicit Congestion Notification for RTP-over-UDP Support package

|  | Mandatory/Optional               | Used in command           | Supported Values  | Provisioned Value   |
|--|----------------------------------|---------------------------|---|---|
| ECN Enabled (ecnrous/ecnen, 0x010b/0x0001)                     | M                                | ADD, MODIFY               | True, False   | -   |
| Congestion Response Method (ecnrous/crm, 0x010b/0x0002)        | O                                | ADD, MODIFY               | "SDCC" (0x0001) (NOTE 2)<br>"RDCC" (0x0002) (NOTE 1)                | "RDCC" (0x0002)   |
| Initiation Method (ecnrous/initmethod, 0x010b/0x0003)          | M                                | ADD, MODIFY               | "rtp" (NOTE 2)<br>"leap",<br>"inactive"                             | "leap"  |
| ECN Mode (ecnrous/mode, 0x010b/0x0004)                         | O                                | ADD, MODIFY               | "setonly" (0x0001) (NOTE 2)<br>"readonly" (0x0002) (NOTE 2)         | "setonly" (0x0001) in the Remote Descriptor and "readonly" (0x0002) in the Local Descriptor |
| ECT Marking (ecnrous/ectmark, 0x010b/0x0005)                   | O                                | ADD, MODIFY               | "1" (0x0001) (NOTE 2)<br>"0" (0x0002)<br>"Random" (0x0003) (NOTE 2) | "0" (0x0002)  |
| ECN Congestion Marking (ecnrous/congestmark, 0x010b/0x0006)    | Not Signalled                    | -                         | -   | "nomark" (0x0003)   |
| ECN SDP Usage (ecnrous/ecnsdp, 0x010b/0x0007)                  | Not Signalled                    | -                         | -   | "P" (0x0001)  |
| <b>Signals</b>   | <b>Mandatory/Optional</b>        | <b>Used in command</b>    |   | <b>Duration Provisioned Value</b>   |
| None   | -                                | -                         |   | -   |
|  | <b>Signal Parameters</b>         | <b>Mandatory/Optional</b> | <b>Supported Values</b>   | <b>Duration Provisioned Value</b>   |
|  | -                                | -                         | -   | -   |
| <b>Events</b>  | <b>Mandatory/Optional</b>        | <b>Used in command</b>    |   |   |
| ECN Failure (ecnrous/fail, 0x010b/0x0001)                      | M                                | ADD, MODIFY, NOTIFY       |   |   |
|  | <b>Event Parameters</b>          | <b>Mandatory/Optional</b> | <b>Supported Values</b>   | <b>Provisioned Value</b>  |
|  | -                                | -                         | -   | -   |
|  | -                                | -                         | -   | -   |
|  | <b>ObservedEvent Parameters</b>  | <b>Mandatory/Optional</b> | <b>Supported Values</b>   | <b>Provisioned Value</b>  |
|  | Failure Type (type, 0x0001)      | Mandatory                 | INIT, USE   | -   |
|  | Media Sender SSRC (ssrc, 0x0002) | Not Supported             | -   | -   |
| <b>Statistics</b>  | <b>Mandatory/Optional</b>        | <b>Used in command</b>    | <b>Supported Values</b>   |   |
| Source (ecnrous/ssrc, 0x010b/0x0001)                           | Not Supported                    | -                         | -   |   |
| CE Counter (ecnrous/cecount, 0x010b/0x0002)                    | Not Supported                    | -                         | -   |   |
| ECT0 Counter (ecnrous/ectzero, 0x010b/0x0003)                  | Not Supported                    | -                         | -   |   |
| ECT1 Counter (ecnrous/ectone, 0x010b/0x0004)                   | Not Supported                    | -                         | -   |   |
| Not-ECT Counter (ecnrous/notect, 0x010b/0x0005)                | Not Supported                    | -                         | -   |   |
| Lost Packets Counter (ecnrous/lost 0x010b/0x0006)              | Not Supported                    | -                         | -   |   |
| Extended Highest Sequence number (ecnrous/ehsn, 0x010b/0x0007) | Not Supported                    | -                         | -   |   |

|   |                           |   |   |
|---|---------------------------|---|---|
| Duplication Counter (ecnrou/dup, 0x010b/0x0008)   | Not Supported             | - | - |
| <b>Error Codes</b>  | <b>Mandatory/Optional</b> |   |   |
| None  | -                         |   |   |
| NOTE1: Application Specific Rate Adaptation shall be applied in accordance with 3GPP TS 26.114 [31]. For speech this requires support of CMR and TMMBR for video. |                           |   |   |
| NOTE 2: This parameter is only supported for the termination towards the external IP network.   |                           |   |   |

## 5.15 Mandatory support of SDP and Annex C information elements

Table 5.15.1: Mandatory Annex C and SDP information elements

| Information Element | Annex C Support | SDP Support  |
|---------------------|-----------------|--|
| v-line              | "SDP_V "        | The value must always be equal to zero: v=0  |
| c-line              | "SDP_C "        | <p>&lt;nettype&gt; &lt;addrtype&gt; and &lt;connection address&gt; are required. The network type shall be set to "IN". The address type may be IPv4 or IPv6. The MGC may apply parameter underspecification to the &lt;connection address&gt; subfield.</p>   |
| m-line              | "SDP_M "        | <p>There are four fields (or SDP values) &lt;media&gt;, &lt;port&gt;, &lt;proto&gt; and &lt;fmt&gt; in the "m=" line (see IETF RFC 4566 [8]; NOTE 1). The "m=" line may be omitted from SDP.</p> <p>&lt;media&gt;, &lt;port&gt;, &lt;proto &gt; and &lt;fmt-list&gt; are required if the "m=" line is included.</p> <p>Media type &lt;media&gt; :<br/>The &lt;media&gt; field shall be set to "audio" or "video" or "message" or "-", When "-" is used for the <i>media</i> value then no media resources are required to be reserved at this stage (NOTE 1). If the MG does not support the requested media value it shall reject the command with error code 515.</p> <p>Transport port &lt;port&gt;<br/>The <i>port</i> value may be underspecified with CHOOSE wildcard.</p> <p>Transport protocol &lt;proto&gt;<br/>As in table 5.15.2.</p> <p>Media format &lt;fmt&gt;<br/>Various values may be used for media-format, dependent on the related &lt;media&gt;.</p> <p>"-" may be used for the <i>format list</i> value if no media reservation is required at this stage.</p> <p>If the MG does not support the requested media format value the MG shall reject the command with error code 449.</p> |
| b-line              | "SDP_B "        | <p>Shall not be used without an "m=" line.</p> <p>The <i>modifier</i> values shall be "AS", "RS" and "RR".<br/>The "AS" <i>modifier</i> implies that the <i>bandwidth-value</i> represents the "maximum bandwidth" (see clause 5.8/IETF RFC 4566 [8]). The <i>bandwidth-value</i> relates therefore to the <i>peak bitrate</i> (NOTE 2).</p> <p>The <i>bandwidth-value</i> value defines the IP layer bandwidth for the specific H.248 Stream.</p> <p>For RTP flows, where RTCP resources are reserved together with the RTP resources using the "RTP Specific Behaviour" property of the Gate Management package (gm) property, the IBCF may also supply additional RTCP bandwidth modifiers (i.e. RR and RS, see IETF RFC 3556 [29]). The AS <i>bandwidth</i> value will include the bandwidth used by RTP. In the absence of the RTCP bandwidth modifiers, the TrGW shall allow an additional 5% of the AS bandwidth value for the bandwidth for RTCP, in accordance with IETF RFC 3556 [29].</p>   |

|   |         |   |
|---|---------|---|
| o-line  | "SDP_O" | <p>The origin line consists of six fields: (&lt;username&gt;, &lt;sess-id&gt;, &lt;sess-version&gt;, &lt;nettype&gt;, &lt;addrtype&gt; and &lt;unicast-address&gt;).</p> <p>The MGC is not required to supply this line but shall accept it (see clause 7.1.8/ITU-T Recommendation H.248.1 [3]).</p> <p>The MG shall return the value received from the MGC or if there is no o-line sent by the MGC, the MG shall populate this line as follows:</p> <ul style="list-style-type: none"> <li>- &lt;user name&gt; should contain an hyphen</li> <li>- &lt;session ID&gt; and &lt;version&gt; should contain one or mode digits as described in IETF RFC 4566 [8]</li> <li>- &lt;network type&gt; shall be set to IN</li> <li>- &lt;address type&gt; shall be set to IP4 or IP6 The Address Type shall be set to "IP4" or "IP6" depending on the addressing scheme used by the network to which the MG is connected.</li> <li>- &lt;address&gt; should contain the fully qualified domain name or IP address of the gateway.</li> </ul> |
| s-line  | "SDP_S" | <p>The session name "s=" line contains a single field s= &lt;session name&gt;.</p> <p>The MGC is not required to supply this line but shall accept it (see clause 7.1.8/ITU-T Recommendation H.248.1 [3]).</p> <p>The MG shall return the value received from the MGC or if there is no s-line sent by the MGC, the MG shall populate this line as follows:</p> <p>- "s=-"</p>  |
| t-line  | "SDP_T" | <p>The time "t=" line consists of two fields t= &lt;start time&gt; and &lt;stop time&gt;.</p> <p>The MGC is not required to supply this line but shall accept it (see clause 7.1.8/ITU-T Recommendation H.248.1 [3]).</p> <p>The MG shall return the value received from the MGC or if there is no t-line sent by the MGC, the MG shall populate this line as follows:</p> <p>"t=0 0"</p>   |
| <p>NOTE 1: IETF RFC 4566 [8] enables "-" as a valid character (i.e. for both IMS-Ix and CS-Ix).</p> <p>NOTE 2: The unit for the <i>bandwidth-value</i> (peak bitrate) is "kbit/s". The "b=" line is not providing any information about the traffic characteristic, i.e. whether the traffic flow has a Constant BitRate (CBR) or Variable BitRate (VBR). The <i>bandwidth-value</i> is thus independent of the traffic characteristic and relates to the peak bitrate for CBR and VBR traffic.</p> |         |   |

Table 5.15.2: Transport Protocol

|  |   |
|--|---|
| <b>Transport Protocol &lt;proto&gt; in m-line:</b> | If the MG does not support the requested transport protocol, it shall reject the command with error code 449.   |
| udp  | Allow only L4 protocol = UDP (NOTE 2).  |
| TCP  | Allow only L4 protocol = TCP (NOTE 3)   |
| TCP/MSRP   | Message service using IETF RFC 4975 [9].  |
| RTP/AVP  | RTP profile according IETF RFC 3551 [10]. Allow only L4 protocol = UDP (see NOTE 2)   |
| RTP/SAVP   | SRTP profile according IETF RFC 3711 [33]. (NOTE 4) Allow only L4 protocol = UDP (see NOTE 2)   |
| RTP/AVPF   | Extended RTP profile for RTCP-based Feedback (RTP/AVPF) according IETF RFC 4585 [30]. See 3GPP TS 26.114 [31]. Allow only L4 protocol = UDP (NOTE 2). |
| RTP/SAVPF  | Extended SRTP profile for RTCP-based Feedback (RTP/SAVPF) according IETF RFC 5124 [34]. (NOTE 4) Allow only L4 protocol = UDP (see NOTE 2)            |
| udptl  | Allow only L4 protocol = UDP  |
|  |   |

NOTE 1: For IMS-Ix the above transports are applicable but for CS-Ix only RTP/AVP, TCP and UdpT are applicable.  
 NOTE 2: Parameter "udp" is introduced by IETF RFC 4566 [8] but not yet registered by IANA (see <http://www.iana.org/assignments/sdp-parameters>).  
 NOTE 3: Upper case TCP is defined by IETF RFC 4145 [11] and registered by IANA. .  
 NOTE 4: Included for support of e2e security, in order to permit rtcp/rsb property to be applied. TrGW does not support associated SRTP/SRTCP stream handling per se. If either RTP/SAVP is signalled at any termination in a context, or if RTP/SAVPF is signalled at any termination in a context, the TrGW shall not terminate SRTP / SRTCP streams and therefore shall not reserve any associated resources, but shall pass media transparently, and shall also pass related RTCP streams (as indicated with the rtcp/rsb property) transparently (for end-to-end media security).

## 5.16 Optional support of SDP and Annex C information elements

Table 5.16.1: Optional SDP Information Elements

| Information Element   | Annex C Support | SDP Support  |
|---|-----------------|--|
| a-line  | "SDP_A "        | <p>1) Application "RTCP transport address control":<br/>           The attribute "a=rtcp" line may either contain (a=rtcp: &lt;port&gt;) or (a=rtcp: &lt;port&gt; &lt;network type&gt; &lt;address type&gt; &lt;connection address&gt;) when the "a=" line is used for RTCP transport port and optionally network address transmission, see IETF RFC 3605 [7].<br/>           The MGC shall supply the "a=rtcp" line in the RD when non-default RTCP network address or transport port values are used by the peer media entity.<br/>           "RTCP transport address control" should be supported by MG.</p> <p>2) Application " Media interworking (transcoding)":<br/>           The "a=" line provides the complementary information for the "m=" line with regards to a specified media type/format (e.g. an optional SDP „a=ptime" line for a particular media format).<br/>           For a dynamic RTP payload type, for each media information on the codec type shall be provided in a separate SDP "a=rtpmap" line and possibly additional SDP "a=fmtp"-line(s). For AVPF transport, the "rtcp-fb" SDP attribute defined in IETF RFC 4585 [30] may be used to provide the feedback message types the TrGW is allowed to send and to indicate RTCP timing information. For ECN interworking, the "rtcp-xr" SDP attribute defined in IETF RFC 3611 [36] may be used with "ecn-sum" value as defined in IETF RFC 6679 [35]. (NOTE)</p> |
| NOTE: Media Interworking is optional for IMS-Ix and not required for CS-Ix. |                 |  |

## 5.17 Procedures

### 5.17.1 Formats and Codes

Table 5.17.1.1 shows the parameters which are required for the procedures defined in the following clauses.

The coding rules applied in ITU-T Recommendation H.248.1 [3] for the applicable coding technique shall be followed for the UMTS capability set.

The binary encoding rules which are applicable to the defined Abstract Syntaxes are the Basic Encoding Rules for Abstract Syntax Notation One, defined in ITU-T Recommendation X.690 [28]. Specifically in accordance with ITU-T Recommendation X.690 [28] section 7.3, alternative encodings based on the definite and indefinite form of length are permitted by the basic encoding rules as a sender's option. Receivers shall support both alternatives.

Unsupported values of parameters or properties may be reported by the TrGW and shall be supported by the IBCF as such by using H.248.1 error code #449 "Unsupported or Unknown Parameter or Property Value". The unsupported or unknown value is included in the error text in the error descriptor.

Table 5.17.1.1: Information Elements Used in Procedures

| Signalling Object          | H.248 Descriptor                         | Coding   |
|----------------------------|--|--|
| Alternate MGC Id           | ServiceChange                            | The MGCIdToTry parameter in ITU-T Recommendation H.248.1 [3].  |
| Available Realms           | Termination State                        | According to <i>Available Realms</i> property in ITU-T Recommendation H.248.41 [14].   |
| BNC Release                | Events,<br>ObservedEvents<br>Descriptor  | As for the Events/ObservedEvents Descriptor in subclause E.1.2.1/ITU-T Recommendation H.248.1 [3] "Cause"  |
| Cause                      | ObservedEvents<br>Descriptor             | As for the ObservedEventsDescriptor Parameter in subclause E.1.2.1/ ITU-T Recommendation H.248.1 [3] "General cause"   |
| Changed Realms             | Observed Events                          | According to Observed Events Parameters for <i>Available Realms Changed</i> event in ITU-T Recommendation H.248.41 [14].   |
| Codec List                 | Local Descriptor or<br>Remote Descriptor | <fmt list> in a single SDP m-line.<br>For a static RTP payload type, the codec type should be implied by the RTP payload type, if not then each codec type shall be provided in a separate SDP "a=rtpmap"-line and possibly additional SDP "a=fmtp"-line(s).<br>For a dynamic RTP payload type, for each codec information on the codec type shall be provided in a separate SDP "a=rtpmap"-line and possibly additional SDP "a=fmtp"-line(s). |
| Connectivity Mode          | Local Control                            | ITU-T Recommendation H.248.1 [3] Mode property.<br>Binary Encoding: Encoding as per ITU-T Recommendation H.248.1 Annex A [3] "streamMode"<br>Textual Encoding: Encoding as per ITU-T Recommendation H.248.1 Annex B [3]"streamMode".   |
| Context ID                 | NA                                       | Binary Encoding: As per ITU-T Recommendation H.248.1 [3] Annex A.<br>Textual Encoding: As per ITU-T Recommendation H.248.1 [3] Annex B.  |
| Delay Variation Tolerance  | Local Control                            | This is the tman/dvt property from ITU-T Recommendation H.248.53 [13]  |
| Diffserv Code Point        | Local Control                            | Defined according to the <i>Differentiated Services Code Point</i> property in ITU-T Recommendation H.248.52 [12].   |
| Diffserv Tagging Behaviour | Local Control                            | Defined according to the <i>Tagging Behaviour</i> property in ITU-T Recommendation H.248.52 [12].  |
| ECN Congestion Response    | Local descriptor or<br>Remote Descriptor | Defined according to "Congestion Response Method" property in ITU-T Recommendation H.248.82 , see Annex B. NOTE  |
| ECN ECT Marking            | Local descriptor or<br>Remote Descriptor | Defined according to "ECT Marking" property in ITU-T Recommendation H.248.82, see Annex B<br>NOTE  |
| ECN Enabled                | Local Descriptor or<br>Remote Descriptor | Defined according to the "ECN Enabled" property in ITU-T Recommendation H.248.82, see Annex B.   |
| ECN Failure                | Events,<br>Observed Events               | Defined according to the "ECN Failure" Event in ITU-T Recommendation H.248.82, see Annex B.  |
| ECN Failure Type           | ObservedEvents<br>Descriptor             | As for the ObservedEventsDescriptor Parameter "Failure Type" in Annex B  |
| ECN Initiation Method      | Local Descriptor or<br>Remote Descriptor | Defined according to "Initiation Method" property in ITU-T Recommendation H.248.82, see Annex B.   |
| ECN Mode                   | Local Descriptor or<br>Remote Descriptor | Defined according to the "ECN Mode" property in ITU-T Recommendation H.248.82, see Annex B.<br>NOTE  |
| ECN RTCP Feedback          | Local Descriptor or<br>Remote Descriptor | "rcfp-fb" SDP attribute with the "nack" feedback parameter as defined in IETF RFC 4585 and the "ecn" parameter value according to IETF RFC 6679 [35]   |
| ECN XR Summary Report      | Local Descriptor or<br>Remote Descriptor | "ecn-sum" value as defined in IETF RFC 6679 [35] within a "rtcp-xr" SDP attribute in accordance with IETF RFC 3611 [36]  |
| Emergency Call Indication  | NA                                       | ITU-T Recommendation H.248.1 [3] 6.1.1 Emergency Call Indicator<br>Binary Encoding: Encoding as per ITU-T Recommendation H.248.1 [3] Annex A "Emergency" context attribute<br>Textual Encoding: Encoding as per ITU-T Recommendation H.248.1 [3] Annex B "EmergencyToken" context attribute  |
| Inactivity Timeout         | Events,<br>Observed Events               | Defined according to <i>Inactivity Timeout</i> event in ITU-T Recommendation H.248.14 [19].  |
| IP Address                 | Local Descriptor or<br>Remote Descriptor | <connection address> in SDP "c-line"   |
| IP Interface               | Local control                            | As for the property "IP interface type" in subclause 15.2.11.1 in  |

|                                      |                                       | 3GPP TS 29.232 [21]   |
|--------------------------------------|---------------------------------------|---|
| IP Realm Identifier                  | Local Control                         | According to <i>IP Realm Identifier</i> property in ITU-T Recommendation H.248.41 [14].   |
| IP Version                           | Local Descriptor or Remote Descriptor | <address type> in SDP "c-line", see 5.15  |
| Maximum Burst Size                   | Local Control                         | This is the tman/mbs property from ITU-T Recommendation H.248.53 [13]   |
| Media Inactivity Detection           | Events, Observed Events               | Defined according to IP Flow Stop Detection event in ITU-T Recommendation H.248.40 [27].  |
| Media Inactivity Detection Time      | Events                                | As for the Event Parameter in ITU-T Recommendation H.248.40 [27] "Detection Time"   |
| Media Inactivity Detection Direction | Events                                | As for the Event Parameter in ITU-T Recommendation H.248.40 [27] "Direction"  |
| Media Type                           | Local Descriptor or Remote Descriptor | <media> in SDP m-line "audio", "video" or "-"   |
| Overload Notification                | Events, Observed Events               | This is the chp/mgcon event from ITU-T Recommendation H.248.10 [20] or the ocp/mg_overload event from ITU-T Recommendation H.248.11 [16].   |
| Peak Data Rate                       | Local Control                         | This is the tman/pdr property from ITU-T Recommendation H.248.53 [13].  |
| Policing Required                    | Local Control                         | This is the tman/pol property from ITU-T Recommendation H.248.53 [13].  |
| Port                                 | Local Descriptor or Remote Descriptor | <port> in SDP m-line.   |
| Priority Information                 | NA                                    | Priority Indicator (subclause 6.1.1 of ITU-T Recommendation H.248.1 [3])<br>Binary Encoding: Encoding as per ITU-T Recommendation H.248.1 [3] Annex A "priority" context attribute<br>Textual Encoding: Encoding as per ITU-T Recommendation H.248.1 [3] Annex B "priority" context attribute |
| Realm Availability Change            | Events, Observed Events               | According to <i>Available Realms Changed</i> event in ITU-T Recommendation H.248.41 [14].   |
| Reduction                            | ObservedEvent Descriptor              | As for the ObservedEventDescriptor in subclause 4.2.1/ ITU-T Recommendation H.248.10 [20] "MGCongestion".   |
| Remote Source Address Filtering      | Local Control                         | Defined according to <i>Remote Source Address Filtering</i> property in ITU-T Recommendation H.248.43 [6].  |
| Remote Source Address Mask           | Local Control                         | Defined according to <i>Remote Source Address Mask</i> property in ITU-T Recommendation H.248.43 [6].   |
| Remote Source Port Filtering         | Local Control                         | Defined according to <i>Remote Source Port Filtering</i> property in ITU-T Recommendation H.248.43 [6].   |
| Remote Source Port                   | Local Control                         | Defined according to <i>Remote Source Port</i> property in ITU-T Recommendation H.248.43 [6].   |
| Remote Source Port Range             | Local Control                         | Defined according to <i>Remote Source Port Range</i> property in ITU-T Recommendation H.248.43 [6].   |
| Reserve_Value                        | Local Control                         | ITU-T Recommendation H.248.1 [3] Reserve property.<br>Binary Encoding: Encoding as per ITU-T Recommendation H.248.1[3] Annex A "reserveValue"<br>Textual Encoding: Encoding as per ITU-T Recommendation H.248.1 [3] Annex B "reservedValueMode".  |
| ROOT Properties                      | Termination State                     | The properties in subclause E.2.1/ITU-T Recommendation H.248.1 [3]  |
| RTCP allocation                      | Local Control                         | Defined according to <i>RTCP Allocation Specific Behaviour</i> property in ITU-T Recommendation H.248.57 [5].   |
| RtcpbwRR                             | Local Descriptor or Remote Descriptor | <bandwidth> in SDP "b:RR"-line. see 5.15  |
| RtcpbwRS                             | Local Descriptor or Remote Descriptor | <bandwidth> in SDP "b:RS"-line. see 5.15  |
| Rtpbw                                | Local Descriptor or Remote Descriptor | <bandwidth> in SDP "b:AS"-line. see 5.15  |
| RTPpayload                           | Local Descriptor or Remote Descriptor | <fmt list> in SDP m-line. This may be set to CHOOSE (\$) in a LD sent from the IBCF toward the TrGW.  |
| Stream Number                        | Stream                                | Encoding as per ITU-T Recommendation H.248.1 [3]Annex B "Stream"/"ST".<br>For a single stream, this may be omitted by the CS-IBCF.  |
| Sustainable Data Rate                | Local Control                         | This is the tman/sdr property from ITU-T Recommendation H.248.53 [13]   |

|   |                                       |   |
|---|---------------------------------------|---|
| Termination heartbeat   | Events ObservedEvents                 | As per <i>Termination Heartbeat</i> defined in ITU-T Recommendation H.248.36 [15] Clause 5.2.1.   |
| Termination ID  | NA                                    | Binary Encoding: As per ITU-T Recommendation H.248.1 [3] Annex A.<br>Textual Encoding: As per ITU-T Recommendation H.248.1 [3] Annex B. |
| Transaction ID  | NA                                    | Binary Encoding: As per ITU-T Recommendation H.248.1 [3] Annex A.<br>Textual Encoding: As per ITU-T Recommendation H.248.1 [3] Annex B. |
| Transport   | Local Descriptor or Remote Descriptor | <transport> in SDP m-line, see 5.15   |
| NOTE: This property is only signalled for IP terminations towards external IP network |                                       |   |

## 5.17.2 Call Related Procedures

### 5.17.2.1 General

This section describes the various call related procedures performed by the TrGW, which are listed in table 5.17.2.1.1

**Table 5.17.2.1.1: TrGW Call Related Procedures**

| Transaction defined in 3GPP TS 29.235 [17] or 3GPP TS 29.162 [18] | Supported | Comment       |
|---|-----------|---------------|
| Reserve TrGW Connection Point                                     | Mandatory | See 5.17.2.2  |
| Configure TrGW Connection Point                                   | Mandatory | See 5.17.2.3  |
| Reserve and Configure TrGW Connection Point                       | Mandatory | See 5.17.2.4  |
| Release TrGW Termination  | Mandatory | See 5.17.2.5  |
| Termination Heartbeat Indication                                  | Mandatory | See 5.17.2.6  |
| IP Bearer Released  | Mandatory | See 5.17.2.7  |
| Media Inactivity Notification                                     | Optional  | See 5.17.2.8  |
| Change Through Connection   | Mandatory | See 5.17.2.9  |
| ECN Failure Indication  | Optional  | See 5.17.2.10 |
| Change Flow Direction   | Optional  | See 5.17.2.11 |

### 5.17.2.2 Reserve TrGW Connection Point

The IBCF sends an ADD request command as in Table 5.17.2.2.1.



**Table 5.17.2.2.1: Reserve TrGW Connection Point Request**

| Address Information  | Control information   | Bearer information  |
|--|---|---|
| <p>Local Descriptor {<br/>                     Port = \$<br/>                     IP Address = \$<br/>                     IP Version = IPv4 or IPv6<br/>                     }<br/>                     }</p> | <p>Transaction ID = x<br/>                     If Context Requested:<br/>                     Context ID= \$<br/>                     If Emergency Call:<br/>                     Emergency Call Indication<br/> <br/>                     If MPS call/session:<br/>                     Priority Indicator = x<br/> <br/>                     If Context Provided:<br/>                     Context ID = c1<br/> <br/>                     Termination ID = \$<br/>                     If Stream Number specified:-<br/>                     Stream Number<br/>                     If Resources for multiple Codecs<br/>                     required:<br/>                     Reserve_Value<br/> <br/>                     If IP Interface Type:<br/>                     IP interface = "IP interface type"<br/> <br/>                     If indication on Bearer Released<br/>                     requested:<br/>                     NotificationRequested (Event ID =<br/>                     x, "BNC Release ")<br/> <br/>                     If diffserv required:-<br/>                     Diffserv Code Point<br/>                     If tagging behaviour<br/>                     Diffserv Tagging Behaviour<br/> <br/>                     If Remote Source Address Filtering<br/>                     required:-<br/>                     Remote Source Address Filtering<br/>                     If Remote Source Address range<br/>                     required:-<br/>                     Remote Source Address Mask<br/>                     If Remote Source Port Filtering<br/>                     required:-<br/>                     Remote Source Port Filtering<br/>                     If individual port:-<br/>                     Remote Source Port<br/>                     If range of ports:<br/>                     Remote Source Port Range<br/> <br/>                     NotificationRequested (Event ID = x,<br/>                     "termination heartbeat")<br/> <br/>                     If multiple IP realms: IP realm<br/>                     Identifier = required IP realm<br/>                     identifier<br/> <br/>                     If Media Inactivity Detection<br/>                     Required:<br/>                     NotificationRequested (Event ID =<br/>                     x, "Media Inactivity Detection<br/>                     (Media Inactivity Detection Time,<br/>                     Media Inactivity Detection<br/>                     Direction) ") (NOTE 1)<br/> <br/>                     If Sustainable Data Rate Policing<br/>                     Required:-<br/>                     Policing Required<br/>                     Sustainable Data Rate</p> | <p>Local Descriptor {<br/>                     If media is "audio" or "video":<br/>                     Codec List = Codec List<br/>                     RTP Payloads = RTP Payload<br/>                     Rtpbw<br/>                     If RTCP bandwidth<br/>                     RtcpbwRS<br/>                     RtcpbwRR<br/>                     }<br/>                     }</p> |

|   |  |  |
|---|--|--|
|   | <p>Maximum Burst Size</p> <p>If peak data rate policing<br/>                 Policing Required<br/>                 Peak Data Rate<br/>                 If Delay Variation required<br/>                 Delay Variation Tolerance</p> <p>If RTCP handling required:<br/>                 RTCP allocation</p> <p>If ECN transparent support required:<br/>                 ECN Enable = "True"<br/>                 Initiation Method = "inactive"</p> <p>If ECN Endpoint support required<br/>                 ECN Enable = "True"<br/>                 Initiation Method = "ECN Initiation Method" NOTE 2</p> <p>Congestion Response = "ECN Congestion Response"<br/>                 NOTE 3</p> <p>ECN Mode = "ECN mode"<br/>                 NOTE 3</p> <p>ECT Marking = "ECN ECT marking" NOTE 3</p> <p>RTCP Feedback = "ECN RTCP Feedback" NOTE 3</p> <p>XR Summary Report = "ECN XR Summary Report" NOTE 3<br/>                 If notification of ECN Failure Report:<br/>                 NotificationRequested (Event ID = x, "ECN Failure")</p> |  |
| <p>NOTE 1: The event parameters "Media Inactivity Detection Time" and "Media Inactivity Detection Direction" are optional.</p> <p>NOTE 2: This shall be set to a value other than "inactive"</p> <p>NOTE 3: For the IMS side/3GPP ECN profile terminations this property does not need to be signalled; default provisioned values are defined for this profile. For procedures to handle interworking between different ECN property settings see 3GPP TS 29.162 [18].</p> |  |  |

Editor's Note: IP Interface Type needs to be further clarified in stage 2 – possible exclusion for IMS Ix.

On reserving the termination, the TrGW responds as in Table 5.17.2.2.2.

**Table 5.17.2.2.2: Reserve TrGW Connection Point Acknowledge**

| Address Information   | Control information   | Bearer information   |
|---|---|--|
| Local Descriptor {<br>Port<br>IP Address<br>IP Version<br>} | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1<br>Stream Number | Local Descriptor {<br>If media is "audio" or "video":<br>Codec List<br>RTP Payloads<br>Rtpbw<br>If RTCP bandwidth<br>RtcpbwRS<br>RtcpbwRR<br>} |

### 5.17.2.3 Configure TrGW Connection Point

The IBCF sends a MODIFY request command as in Table 5.17.2.3.1.

**Table 5.17.2.3.1: Configure TrGW Connection Point Request**

| Address Information   | Control information   | Bearer information   |
|---|---|--|
| <p>If local resources are modified:<br/>                     Local Descriptor {<br/>                         Port<br/>                         IP Address<br/>                         IP Version<br/>                     }<br/>                     If remote resources are modified:<br/>                     Remote Descriptor {<br/>                         Port<br/>                         IP Address<br/>                         IP Version<br/>                     }</p> | <p>Transaction ID = x<br/>                     Context ID = C1<br/>                     Termination ID = T1<br/> <br/>                     If MPS priority is modified:<br/>                         Priority Indicator = x (NOTE 5)<br/> <br/>                     If Stream Number specified:<br/>                         Stream Number<br/> <br/>                     If Resources for multiple Codecs required:<br/>                         Reserve_Value<br/> <br/>                     If diffserv required:-<br/>                         Diffserv Code Point<br/>                     If tagging behaviour<br/>                         Diffserv Tagging Behaviour<br/> <br/>                     If Remote Source Address Filtering required:-<br/>                         Remote Source Address Filtering<br/>                         If Remote Source Address range required:-<br/>                             Remote Source Address Mask<br/>                         If Remote Source Port Filtering required:-<br/>                             Remote Source Port Filtering<br/>                             If individual port:-<br/>                                 Remote Source Port<br/>                             If range of ports:<br/>                                 Remote Source Port Range<br/> <br/>                     NotificationRequested (Event ID = x, "termination heartbeat")<br/> <br/>                     If multiple IP realms: IP realm Identifier = required IP realm (NOTE 1)<br/> <br/>                     If Media Inactivity Detection Required:<br/>                         NotificationRequested (Event ID = x, "Media Inactivity Detection (Media Inactivity Detection Time, Media Inactivity Detection Direction) ") (NOTE 2)<br/> <br/>                     If Sustainable Data Rate Policing Required:-<br/>                         Policing Required<br/>                         Sustainable Data Rate<br/>                         Maximum Burst Size<br/> <br/>                     If peak data rate policing<br/>                         Policing Required<br/>                         Peak Data Rate<br/>                         If Delay Variation required<br/>                             Delay Variation Tolerance<br/> <br/>                     If RTCP handling required:<br/>                         RTCP allocation<br/> <br/>                     If ECN transparent support required:<br/>                         ECN Enable = "True"</p> | <p>If local resources are modified:<br/>                     Local Descriptor {<br/>                         If media is "audio" or "video":<br/>                             Codec List<br/>                             RTP Payloads<br/>                             Rtpbw<br/>                             If RTCP bandwidth<br/>                                 RtcpbwRS<br/>                                 RtcpbwRR<br/>                     }<br/>                     If remote resources are modified:<br/>                     Remote Descriptor {<br/>                         If media is "audio" or "video":<br/>                             Codec List<br/>                             RTP Payloads<br/>                             Rtpbw<br/>                             If RTCP bandwidth<br/>                                 RtcpbwRS<br/>                                 RtcpbwRR<br/>                     }<br/>                     }</p> |

|   |   |  |
|---|---|--|
|   | <p>Initiation Method = "inactive"</p> <p>If ECN Endpoint support required<br/> ECN Enable = "True"<br/> Initiation Method = "ECN Initiation Method" NOTE 3</p> <p>Congestion Response = "ECN Congestion Response"<br/> NOTE 4</p> <p>ECN Mode = "ECN mode"<br/> NOTE 4</p> <p>ECT Marking = "ECN ECT marking" NOTE 4</p> <p>RTCP Feedback = "ECN RTCP Feedback" NOTE 4</p> <p>XR Summary Report = "ECN XR Summary Report" NOTE 4</p> <p>If notification of ECN Failure Report:<br/> NotificationRequested (Event ID = x, "ECN Failure")</p> |  |
| <p>NOTE 1: This shall only be set to the same IP realm as at the reservation stage which is specified in Table 5.17.2.2.1. If a different IP realm is specified, the TrGW shall return error 501 "Not Implemented". Additional streams may be added by the Configure_TrGW_Connection_Point procedure. The additional streams shall then carry the same IP Realm Identifier as the first stream.</p> <p>NOTE 2: The event parameters "Media Inactivity Detection Time" and "Media Inactivity Detection Direction" are optional.</p> <p>NOTE 3: This shall be set to a value other than "inactive".</p> <p>NOTE 4: For the IMS side/3GPP ECN profile terminations this property does not need to be signalled; default provisioned values are defined for this profile. For procedures to handle interworking between different ECN property settings see 3GPP TS 29.162 [18].</p> <p>NOTE 5: The support of the modification of the Priority Indicator value is optional for the IMS-AGW and depends on implementation solution for Priority call/session authorisation (see 3GPP TS 29.162 [18]).</p> |   |  |

The TrGW responds as in Table 5.17.2.3.2.

**Table 5.17.2.3.2: Configure TrGW Connection Point Request Acknowledge**

| Address Information  | Control information  | Bearer information   |
|--|--|--|
| If local resources were provided in request:<br>Local Descriptor {<br>Port<br>IP Address<br>IP Version<br>}<br>If remote resources are provided in request:<br>Remote Descriptor {<br>Port<br>IP Address<br>IP Version<br>} NOTE | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1<br><br>If Stream Number Specified:<br>Stream Number | If local resources were provided in request:<br>Local Descriptor {<br>If media is "audio" or "video":<br>Codec List<br>RTP Payloads<br>Rtpbw<br>If RTCP bandwidth<br>RtcpbwRS<br>RtcpbwRR<br>}<br>If remote resources are provided in request:<br>Remote Descriptor {<br>If media is "audio" or "video":<br>Codec List<br>RTP Payloads<br>Rtpbw<br>If RTCP bandwidth<br>RtcpbwRS<br>RtcpbwRR<br>} NOTE |
| NOTE: Sending of the Remote Descriptor is optional   |  |  |

### 5.17.2.4 Reserve and Configure TrGW Connection Point

The IBCF sends an ADD request command as in Table 5.17.2.4.1.

**Table 5.17.2.4.1: Reserve and Configure TrGW Connection Point Request**

| Address Information   | Control information   | Bearer information   |
|---|---|--|
| <p>Local Descriptor {<br/>                     Port = \$<br/>                     IP Address = \$<br/>                     IP Version = IPv4 or IPv6<br/>                 }<br/>                 Remote Descriptor {<br/>                     Port<br/>                     IP Address<br/>                     IP Version<br/>                 }</p> | <p>Transaction ID = x<br/>                     If Context Requested:<br/>                     Context ID = \$<br/>                     If Emergency Call:<br/>                     Emergency Call Indication<br/> <br/>                     If MPS call/session:<br/>                     Priority Indicator = x<br/> <br/>                     If Context Provided:<br/>                     Context ID = c1<br/> <br/>                     Termination ID = \$<br/> <br/>                     If Stream Number Specified:<br/>                     Stream Number<br/>                     If Resources for multiple Codecs shall be reserved:<br/>                     Reserve_Value<br/> <br/>                     If IP Interface Type:<br/>                     IP interface = "IP interface type"<br/> <br/>                     If indication on Bearer Released requested:<br/>                     NotificationRequested (Event ID = x, "BNC Release ")<br/> <br/>                     If diffserv required:-<br/>                     Diffserv Code Point<br/>                     If tagging behaviour<br/>                     Diffserv Tagging Behaviour<br/> <br/>                     If Remote Source Address Filtering required:-<br/>                     Remote Source Address Filtering<br/>                     If Remote Source Address range required:-<br/>                     Remote Source Address Mask<br/> <br/>                     If Remote Source Port Filtering required:-<br/>                     Remote Source Port Filtering<br/>                     If individual port:-<br/>                     Remote Source Port<br/>                     If range of ports:<br/>                     Remote Source Port Range<br/> <br/>                     NotificationRequested (Event ID = x, "termination heartbeat")<br/> <br/>                     If multiple IP realms: IP realm Identifier = required IP realm identifier<br/> <br/>                     If Media Inactivity Detection Required:<br/>                     NotificationRequested (Event ID = x, "Media Inactivity Detection (Media Inactivity Detection Time, Media Inactivity Detection Direction) ") (NOTE 1)<br/> <br/>                     If Sustainable Data Rate Policing Required:-</p> | <p>Local Descriptor {<br/>                     If media is "audio" or "video":<br/>                     Codec List<br/>                     RTP Payloads<br/>                     Rtpbw<br/>                     If RTCP bandwidth<br/>                     RtcpbwRS<br/>                     RtcpbwRR<br/>                 }<br/>                 Remote Descriptor {<br/>                     If media is "audio" or "video":<br/>                     Codec List<br/>                     RTP Payloads<br/>                     Rtpbw<br/>                     If RTCP bandwidth<br/>                     RtcpbwRS<br/>                     RtcpbwRR<br/>                 }</p> |

|   |  |  |
|---|--|--|
|   | <p>Policing Required<br/>Sustainable Data Rate<br/>Maximum Burst Size</p> <p>If peak data rate policing<br/>Policing Required<br/>Peak Data Rate<br/>If Delay Variation required<br/>Delay Variation Tolerance</p> <p>If RTCP handling required:<br/>RTCP allocation</p> <p>If ECN transparent support required:<br/>ECN Enable = "True"<br/>Initiation Method = "inactive"</p> <p>If ECN Endpoint support required<br/>ECN Enable = "True"<br/>Initiation Method = "ECN Initiation Method" NOTE 2</p> <p>Congestion Response = "ECN Congestion Response"<br/>NOTE 3<br/>ECN Mode = "ECN mode"<br/>NOTE 3<br/>ECT Marking = "ECN ECT marking" NOTE 3</p> <p>RTCP Feedback = "ECN RTCP Feedback" NOTE 3</p> <p>XR Summary Report = "ECN XR Summary Report" NOTE 3</p> <p>If notification of ECN Failure Report:<br/>NotificationRequested (Event ID = x, "ECN Failure")</p> |  |
| <p>NOTE 1: The event parameters "Media Inactivity Detection Time" and "Media Inactivity Detection Direction" are optional.</p> <p>NOTE 2: This shall be set to a value other than "inactive"</p> <p>NOTE 3: For the IMS side/3GPP ECN profile terminations this property does not need to be signalled; default provisioned values are defined for this profile. For procedures to handle interworking between different ECN property settings see 3GPP TS 29.162 [18].</p> |  |  |

The TrGW responds as in Table 5.17.2.4.2.



**Table 5.17.2.4.2: Reserve and Configure TrGW Connection Point Request Acknowledge**

| Address Information  | Control information   | Bearer information   |
|--|---|--|
| Local Descriptor {<br>Port<br>IP Address<br>IP Version<br>}<br>Remote Descriptor {<br>Port<br>IP Address<br>IP Version<br>} NOTE | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1<br>Stream Number | Local Descriptor {<br>If media is "audio" or "video":<br>Codec List<br>RTP Payloads<br>Rtpbw<br>If RTCP bandwidth<br>RtcpbwRS<br>RtcpbwRR<br>}<br>Remote Descriptor {<br>If media is "audio" or "video":<br>Codec List<br>RTP Payloads<br>Rtpbw<br>If RTCP bandwidth<br>RtcpbwRS<br>RtcpbwRR<br>} NOTE |
| NOTE: Sending of the Remote Descriptor is optional   |   |  |

**5.17.2.5 Release TrGW Termination**

The IBCF sends a SUBTRACT command as in Table 5.17.2.5.1.

**Table 5.17.2.5.1: Release TrGW Termination Request**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID= C1/ALL<br>Termination ID = T1/ALL |                    |

On releasing the termination, the TrGW responds as in Table 5.17.2.5.2

**Table 5.17.2.5.2: Release TrGW Termination Request Acknowledge**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = C1/ALL<br>Termination ID = T1/ALL |                    |

**5.17.2.6 Termination Heartbeat Indication**

When the procedure "Termination heartbeat indication" is required the following procedure is initiated: the TrGW sends a NOT.req command with the following information.

**5.17.2.6.1 NOT.req (Termination heartbeat)**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1<br><br>Event_ID (Event ID = x, "termination heartbeat") |                    |

When processing of the command is complete, the IBCF initiates the following procedure.

#### 5.17.2.6.2 NOT.resp (Termination heartbeat)

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1 |                    |

The IBCF is in charge of correcting any detected mismatch, by subtracting hanging terminations or clearing hanging contexts.

#### 5.17.2.7 IP Bearer Released

When the procedure "IP Bearer Released" is required the following procedure is initiated: the TrGW sends a NOT.req command with the following information.

##### 5.17.2.7.1 NOT.req (IP Bearer Released)

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1<br><br>Event_ID (Event ID = x,<br>"BNC Release (Cause)") |                    |

When the processing of command is complete, the IBCF initiates the following procedure.

##### 5.17.2.7.2 NOT.resp (IP Bearer Released)

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1 |                    |

#### 5.17.2.8 Media Inactivity Notification

When the procedure "Media Inactivity Notification" is required the following procedure is initiated: the TrGW sends a NOT.req command with the following information.

##### 5.17.2.8.1 NOT.req (Media Inactivity)

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1<br><br>Event_ID (Event ID = x, "Media<br>Inactivity Detection") |                    |

When the processing of command is complete, the IBCF initiates the following procedure.

##### 5.17.2.8.2 NOT.resp (Media Inactivity)

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1 |                    |

### 5.17.2.9 Change Through Connection

The IBCF sends an ADD or a MODIFY request command as in Table 5.17.2.9.1.

#### 5.17.2.9.1 Change Through Connection Request

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>If Context Requested:<br>Context ID = \$<br>If Context Provided:<br>Context ID = c1<br><br>If Termination Requested:<br>Termination ID = \$<br>If Termination Provided:<br>Termination ID = T1<br><br>Through-Connection = Connectivity Mode |                    |

The TrGW responds as in Table 5.17.2.9.2.

#### 5.17.2.9.2 Change Through Connection Request Acknowledge

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1 |                    |

### 5.17.2.10 ECN FailureIndication

The TrGW sends a NOTIFY request command as in Table 5.17.2.10.1.

**Table 5.17.2.10.1: ECN Failure Indication**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID= C1<br>Termination ID = T1<br><br>Event_ID (Event ID = x,<br>" ECN Failure (ECN Failure Type)") |                    |

The IBCF responds as in Table 5.17.2.10.2

**Table 5.17.2.10.2: ECN Failure Indication Ack**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1 |                    |

### 5.17.2.11 Change Flow Direction

The TrGW sends an ADD or a MODIFY request command as in Table 5.17.2.11.1.

**5.17.2.11.1 Change Flow Direction**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>If Context Requested:<br>Context ID = \$<br>If Context Provided:<br>Context ID = c1<br><br>If Termination Requested:<br>Termination ID = \$<br>If Termination Provided:<br>Termination ID = T1<br><br>Connection Configuration =<br>(TerminationID= x1,<br>TerminationID=x2, [type = x]) |                    |

The IBCF responds as in Table 5.17.2.11.2.

**5.17.2.11.2 Change Flow Direction Acknowledge**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = C1<br>Termination ID = T1 |                    |

**5.17.3 Non-Call Related Procedures****5.17.3.1 General**

This section describes the various non-call related procedures which are listed in Table 5.17.3.1.1

**Table 5.17.3.1.1: TrGW Non-Call Related Procedures**

| Transaction defined in 3GPP TS 29.235 [17] or 3GPP TS 29.162 [18]  | Support              | Comment  |
|--|----------------------|--|
| TrGW Out of service  | Mandatory            | 5.17.3.2   |
| TrGW Communication Up  | Mandatory            | 5.17.3.3   |
| TrGW Restoration   | Mandatory            | 5.17.3.4   |
| TrGW Register  | Mandatory            | 5.17.3.5   |
| TrGW Re-register   | Optional<br>(NOTE 3) | 5.17.3.6   |
| IBCF Ordered Re-register   | Optional<br>(NOTE 3) | 5.17.3.7   |
| IBCF Restoration   | Optional             | 5.17.3.8   |
| IBCF Out of Service  | Optional             | 5.17.3.9   |
| Audit Value  | Optional<br>(NOTE 3) | 5.17.3.10  |
| Command Rejected   | Mandatory            | The "Command Rejected" procedure may be used in response both to call-related and non-call-related ITU-T Recommendation H.248 Commands – 5.17.3.11 |
| TrGW Capability Change   | Optional             | 5.17.3.12  |
| TrGW Resource Congestion Handling – Activate   | Optional             | 5.17.3.13  |
| TrGW Resource Congestion Handling – Indication   | Optional             | 5.17.3.14  |
| Inactivity timeout activation  | Optional<br>(NOTE 4) | 5.17.3.15  |
| Inactivity timeout indication  | Optional<br>(NOTE 4) | 5.17.3.16  |
| Realm Availability Change activation   | Optional             | 5.17.3.17  |
| Realm Availability Change indication   | Optional             | 5.17.3.18  |
| Termination Out of Service   | Optional<br>(NOTE 1) | 5.17.3.19 (NOTE 2)   |
| NOTE 1: Support of this procedure is mandatory in the IBCF.<br>NOTE 2: The "Termination Out-of-Service procedure" is also used as a call-related H.248 command<br>NOTE 3: Support of this procedure is mandatory in the TrGW.<br>NOTE 4: Support of this procedure is mandatory in the TrGW if UDP transport is supported. |                      |  |

### 5.17.3.2 TrGW Out Of Service

The TrGW sends a SERVICE CHANGE request command as in Table 5.17.3.2.1.

**Table 5.17.3.2.1: TrGW Out Of Service Request**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT<br>SC Method = FORCED or GRACEFUL<br>SC Reason = 905 Termination Taken OOS or 908 MG Impending Failure or 915 State Loss |                    |

The IBCF responds as in Table 5.17.3.2.2.

**Table 5.17.3.2.2: TrGW Out Of Service Request Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT |                    |

### 5.17.3.3 TrGW Communication Up

The TrGW sends a SERVICE CHANGE request command as in Table 5.17.3.3.1 to the IBCF address to which the control link association was previously established.

**Table 5.17.3.3.1: TrGW Communication Up**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID= -<br>Termination ID = ROOT<br>SC Method = DISCONNECTED<br>SC Reason = 900 , Service Restored |                    |

The IBCF may respond as in table 5.17.3.3.2. If a response is received, the control link association is re-established and the inactivity timer would be restarted.

**Table 5.17.3.3.2: TrGW Communication Up Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT<br>If required to register to new IBCF:<br>Alternate MGC Id |                    |

### 5.17.3.4 TrGW Restoration

When the TrGW has recovered, the TrGW sends a SERVICE CHANGE as in Table 5.17.3.4.1,

**Table 5.17.3.4.1: TrGW Restoration**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID= -<br>Termination ID = ROOT<br>SC Method = RESTART<br>SC Reason = 900, Service Restored |                    |

The IBCF responds as in Table 5.17.3.4.2.

**Table 5.17.3.4.2: TrGW Restoration Ack**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT<br>If required to register to new IBCF :<br>Alternate MGC Id |                    |

### 5.17.3.5 TrGW Register

The TrGW sends a SERVICE CHANGE request command as in Table 5.17.3.5.1.

**Table 5.17.3.5.1: TrGW Register**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID= -<br>Termination ID = ROOT<br>SC Method = RESTART<br>SC Reason =901, Cold Boot or 902,<br>Warm Boot<br>H248 Profile Identity<br>H248 Protocol Version |                    |

The IBCF responds as in Table 5.17.3.5.2.

**Table 5.17.3.5.2: TrGW Register Ack**

| Address Information  | Control information  | Bearer information |
|--|--|--------------------|
|  | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT<br>If applicable (NOTE): H248<br>Protocol Version<br>If applicable:-<br>H248 Profile Identity<br>If required to register to new IBCF :<br>Alternate MGC Id |                    |
| NOTE: The IBCF shall include the H.248 Protocol Version if the protocol version it supports or offers is lower than that proposed by the TrGW. The IBCF may include the H.248 Protocol Version if the protocol version it supports or offers is the protocol version proposed by the TrGW. |  |                    |

### 5.17.3.6 TrGW Re-Register

The TrGW sends a SERVICE CHANGE request command as in Table 5.17.3.6.1.

**Table 5.17.3.6.1: Re-Registration**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID= -<br>Termination ID = ROOT<br>SC Method = Handoff<br>SC Reason = 903, MGC Directed<br>Change<br>H248 Profile Identity<br>H248 Protocol Version |                    |

The IBCF responds as in Table 5.17.3.6.2.

**Table 5.17.3.6.2: Re-Registration Ack**

| Address Information   | Control information   | Bearer information |
|---|---|--------------------|
|   | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT<br>If applicable (NOTE 1):<br>H248 Protocol Version<br>If applicable:-<br>H248 Profile Identity<br>If required to register to a new IBCF:<br>Alternate MGC Id |                    |
| NOTE 1: The IBCF shall include the H.248 Protocol Version if the protocol version it supports or offers is lower than that proposed by the TrGW. The IBCF may include the H.248 Protocol Version if the protocol version it supports or offers is the protocol version proposed by the TrGW.            |   |                    |
| NOTE 2: The ServiceChangeMGCId parameter may be returned in the TrGW Re-register response. If present in the response, the TrGW shall not consider itself registered and should preferably attempt to re-register with the IBCF specified in the ServiceChangeMgcId before any further alternate IBCFs. |   |                    |

### 5.17.3.7 IBCF Ordered Re-register

The IBCF sends a SERVICE CHANGE request command as in Table 5.17.3.7.1.

**Table 5.17.3.7.1: IBCF Ordered Re-Register**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID= -<br>Termination ID = ROOT<br>SC Method = HANDOFF<br>SC Reason = 903, MGC Directed Change<br>Alternate MGC Id |                    |

The TrGW responds as in Table 5.17.3.7.2.

**Table 5.17.3.7.2: IBCF Ordered Re-Register Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT |                    |

The TrGW then performs a TrGW Re-Register procedure according to Clause 5.17.3.6.

### 5.17.3.8 IBCF Restoration

When the IBCF has recovered, the IBCF sends a SERVICE CHANGE as in Table 5.17.3.8.1,

**Table 5.17.3.8.1: IBCF Restoration**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID= -<br>Termination ID = ROOT<br>SC Method = RESTART<br>SC Reason = 901, Cold Boot OR<br>902, Warm Boot |                    |



The TrGW responds as in Table 5.17.3.8.2.

**Table 5.17.3.8.2: IBCF Restoration Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT |                    |

### 5.17.3.9 IBCF Out of Service

The IBCF sends a SERVICE CHANGE request command as in Table 5.17.3.9.1.

**Table 5.17.3.9.1: BCF Out Of Service**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT<br>SC Method = FORCED or<br>GRACEFUL<br>SC Reason = 905, Termination<br>Taken OOS |                    |

The TrGW responds as in Table 5.17.3.9.2.

**Table 5.17.3.9.2: IBCF Out Of Service Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT |                    |

### 5.17.3.10 Audit Value

The IBCF sends an AUDIT VALUE request command as in Table 5.17.3.10.1.

**Table 5.17.3.10.1: Audit Value**

| Address Information   | Control information   | Bearer information |
|---|---|--------------------|
|   | Transaction ID = x<br>Context ID= -/ALL/C1<br>Termination ID =<br>ROOT/ALL/T1/PartialWildcard<br>(NOTE 4, NOTE5)<br><br>Audit Packages (NOTE 1)<br><br>Audit Descriptor =<br>IndAuditParameter:=<br>IndAudMediaDescriptor:=<br>IndAudTerminationStateDescriptor:=<br>serviceState<br><br>Audit Descriptor = Empty (NOTE 2)<br><br>Audit Descriptor =<br>IndAuditParameter:=<br>IndAudMediaDescriptor:=<br>IndAudTerminationStateDescriptor:=<br>Available Realms (NOTE 3)<br><br>Audit Descriptor =<br>IndAuditParameter:=<br>IndAudMediaDescriptor:=<br>IndAudTerminationStateDescriptor:=<br>ROOT properties (NOTE 6) |                    |
| NOTE 1: Packages is for Null/Root Combination.<br>NOTE 2: Used for control association monitoring.<br>NOTE 3: Used for auditing available IP realms<br>NOTE 4: The partial wildcard termination is used for the context audit (see table 5.17.3.10.3) and specifies the "group" part of the termination identity (e.g. "ip/5/*").<br>NOTE 5: Partial wildcard shall only be used when text encoding is used on the H.248 interface.<br>NOTE 6: Used for auditing ROOT properties. |   |                    |

The TrGW responds as in Table 5.17.3.10.2.

**Table 5.17.3.10.2: Audit Value Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -/C1<br>Termination ID = ROOT/T1<br>Packages List<br>serviceState<br>Available Realms<br>ROOT Properties |                    |

Upon reception of the command in the TrGW:

- The Service State returns the current Service State
- When Packages are requested, the Package Names and Versions are returned
- When realm availability is audited, the list of available realms is returned.
- When root properties are audited, the values of root properties are returned.

The following table illustrates the allowed combinations that can be obtained with the AuditValue Command:

**Table 5.17.3.10.3: Combinations of AuditValue Command**

| ContextID  | TerminationID    | Information Obtained  |
|--|------------------|---|
| Specific   | Wildcard         | Audit of matching Terminations in a Context   |
| Specific   | Specific         | Audit of a single Termination in a Context  |
| Null   | Root             | Audit of Media Gateway state and/or control association or available realms or supported packages or ROOT properties. |
| All  | Specific         | (Non-null) ContextID in which the Termination currently exists  |
| All  | Partial Wildcard | (Non-null) ContextIDs in which the Terminations currently exist   |
| NOTE: Partial wildcard shall only be used when text encoding is used on the H.248 interface. |                  |   |

### 5.17.3.11 Command Rejected

When the procedure "Command Reject" is required the following procedure is initiated:

The TrGW / IBCF sends a response to any command.req with the following information.

**Table 5.17.3.11.1: ANYcommand.resp (command reject) TrGW/IBCF to IBCF/TrGW**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = z<br>Context ID = c1 or no context<br>Termination ID = T1 or no termination ID<br><br>Reason=Error |                    |

### 5.17.3.12 TrGW Capability Change

The TrGW sends a SERVICE CHANGE request command as in Table 5.17.3.12.1.

**Table 5.17.3.12.1: Capability Update**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID= -<br>Termination ID = ROOT<br>SC Method = RESTART<br>SC Reason = 917, Capability Change<br>H248 Profile Identity<br>H248 Protocol Version |                    |

The IBCF responds as in table 5.17.3.12.2.

**Table 5.17.3.12.2 Capability Update Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT |                    |

### 5.17.3.13 TrGW Resource Congestion Handling – Activate

The IBCF sends a MODIFY request command as in Table 5.17.3.13.1

**Table 5.17.3.13.1: TrGW Resource Congestion Handling – Activate**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID= -<br>Termination ID = ROOT<br><br>NotificationRequested (Event ID = x,<br>"Overload Notification") |                    |

The TrGW responds as in Table 5.17.3.13.2.

**Table 5.17.3.13.2: TrGW Resource Congestion Handling – Activate Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT |                    |

#### 5.17.3.14 TrGW Resource Congestion Handling – Indication

The TrGW sends a NOTIFY request command as in Table 5.17.3.14.1

**Table 5.17.3.14.1: TrGW Resource Congestion Handling – Indication**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID= -<br>Termination ID = ROOT<br><br>If H.248.11 used:<br>Event_ID (Event ID = x,<br>"Overload Notification")<br><br>If H.248.10 used:<br>Event_ID (Event ID = x, "<br>Overload Notification<br>(Reduction)") |                    |

The IBCF responds as in Table 5.17.3.14.2

**Table 5.17.3.14.2: TrGW Resource Congestion Handling – Indication Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT |                    |

#### 5.17.3.15 Inactivity Timeout – Activation

The IBCF sends a MODIFY request command as in Table 5.17.3.15.1

**Table 5.17.3.15.1: Inactivity Timeout – Activation**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID= NULL<br>Termination ID = ROOT<br><br>NotificationRequested (Event ID = x, "Inactivity Timeout") |                    |

The TrGW responds as in Table 5.17.3.15.2.

**Table 5.17.3.15.2: Inactivity Timeout – Activation Ack**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = NULL<br>Termination ID = ROOT |                    |

### 5.17.3.16 Inactivity Timeout – Indication

The TrGW sends a NOTIFY request command as in Table 5.17.3.16.1.

**Table 5.17.3.16.1: Inactivity Timeout – Indication**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID= NULL<br>Termination ID = ROOT<br>Event_ID (Event ID = x, "Inactivity Timeout") |                    |

The IBCF responds as in Table 5.17.3.16.2

**Table 5.17.3.16.2: Inactivity Timeout – Indication Ack**

| Address Information | Control information  | Bearer information |
|---------------------|--|--------------------|
|                     | Transaction ID = x<br>Context ID = NULL<br>Termination ID = ROOT |                    |

### 5.17.3.17 Realm Availability Change – Activation

The IBCF sends a MODIFY request command as in Table 5.17.3.17.1.

**Table 5.17.3.17.1: Realm Availability Change – Activation**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID= -<br>Termination ID = ROOT<br><br>NotificationRequested (Event ID = x, "Realm Availability Change") |                    |

The TrGW responds as in Table 5.17.3.17.2.

**Table 5.17.3.17.2: Realm Availability Change – Activation Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT |                    |

**5.17.3.18 Realm Availability Change – Indication**

The TrGW sends a NOTIFY request command as in Table 5.17.3.18.1.

**Table 5.17.3.18.1: Realm Availability Change – Indication**

| Address Information  | Control information  | Bearer information |
|--|--|--------------------|
|  | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT<br><br>Event_ID (Event ID = x,<br>"Realm Availability Change<br>(Changed Realms)") |                    |
| NOTE: The ObservedEvent Parameters returned within the Changed Realms are defined as mandatory since it shall contain at minimum 1 parameter but may contain both Newly Available Realms and Newly Unavailable Realms. |  |                    |

The IBCF responds as in Table 5.17.3.18.2

**Table 5.17.3.18.2: Realm Availability Change – Indication Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = -<br>Termination ID = ROOT |                    |

**5.17.3.19 Termination Out Of Service**

This procedure only applies when text encoding is used on the H.248 interface.

The TrGW sends a SERVICE CHANGE request command as in Table 5.17.3.19.1.

**Table 5.17.3.19.1: Termination Out Of Service Request**

| Address Information  | Control information  | Bearer information |
|--|--|--------------------|
|  | Transaction ID = x<br>Context ID = C1/ALL<br>Termination ID = T1 or Wildcarded<br>Termination (NOTE)<br>SC Method = FORCED<br>SC Reason = 904 ("Termination<br>Malfunction") or 905 ("Termination<br>Taken OOS") or 906 ("Loss of Lower<br>Layer Connectivity"), or 907<br>("Transmission Failure") or 910<br>("Media Capability Failure") |                    |
| NOTE: This is set to a specific termination identity or a partially wildcarded identity (i.e. specifying the "interface" part of the termination ID and wildcarding the "group" and "Id" parts) or a wholly wildcarded identity (i.e. ip/*). |  |                    |

The IBCF responds as in Table 5.17.3.19.2.

**Table 5.17.3.19.2: Termination Out Of Service Request Ack**

| Address Information | Control information   | Bearer information |
|---------------------|---|--------------------|
|                     | Transaction ID = x<br>Context ID = C1/ALL<br>Termination ID = As received |                    |

# Annex A (informative): Illustration of Gate/Pinhole Concept

## A.1 General

The purpose of this informative annex is the illustration of the H.248 Stream/Termination model by showing exemplary realisations of gates for unidirectional versus bidirectional media flows.

Only point-to-point sessions are in scope of this H.248 Profile (see clause 5.4). Interconnection of individual H.248 Streams is based on the basic principle described in clause 7.1.6/ ITU-T Recommendation H.248.1 [3]. The H.248 Multiplex Descriptor is therefore not necessary (see clause 5.6.2). The H.248 Topology Descriptor definition includes individual H.248 Streams, but is also not necessary (see clause 5.7.8).

NOTE: all sessions have unicast media flows. Potential multicast applications are transparent for MG point of view.

## A.2 Relationships between gates and H.248 Streams

The realization of a gate is illustrated in figure A.2.1. There is a unidirectional media flow in that example, and there is a single H.248 Stream per Termination. A **H.248 Stream** covers per definition a single **bidirectional** media flow (clause 7.1.6/ITU-T Recommendation H.248.1 [3]). Media flows are interconnected by using the same **StreamID** (here: StreamID equals to S1 for T1 and T2).

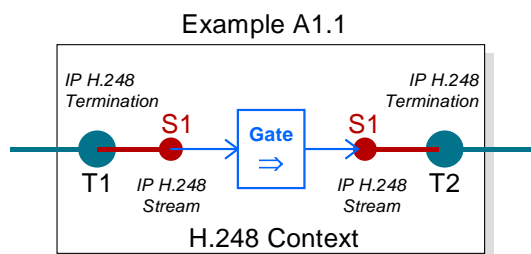


Figure A.2.1: H.248 Context - Illustration of Gate, Stream and Terminations

The uni- or bidirectional application of an H.248 Streams is controlled via usage of Local Descriptor (LD) and Remote Descriptor (RD). Figure A.2.2 shows a bidirectional session. There is again a single H.248 Stream per Termination. Gates are direction-dependent, there are consequently two gates in this example.

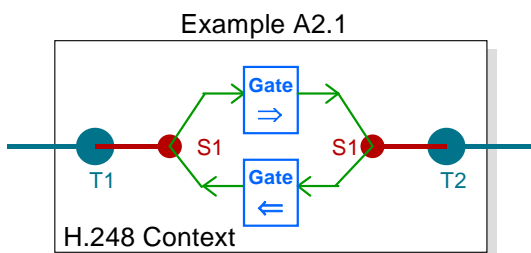


Figure A.2.2: H.248 Context Bidirectional Session using single H.248 Streams



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# Annex B (informative): Draft Explicit Congestion Notification for RTP-over-UDP Support Package

The follow text represents the latest draft for ITU-T Q3/16.

## Draft ITU-T Recommendation H.248.82 (ex H.248.ECN)

### Gateway Control Protocol: Explicit Congestion Notification Support

#### AAP Summary

[To be added before Consent]

#### Summary

[To be added]

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## 1 Scope

[To be added]

---

## 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.

- |                  |   |
|------------------|---|
| [ITU-T E.107]    | Recommendation ITU-T E.107 (2007), <i>Emergency Telecommunications Service (ETS) and interconnection framework for national implementations of ETS</i> .  |
| [ITU-T H.248.1]  | Recommendation ITU-T H.248.1 (09/05) + Amendment 1 (05/08) + Amendment 2 (12/09), <i>Gateway Control Protocol: Version 3</i> .  |
| [ITU-T H.248.47] | Recommendation ITU-T H.248.47 (07/08), <i>Gateway Control Protocol: Statistic conditional reporting package</i> .   |
| [ITU-T H.248.50] | Recommendation ITU-T H.248.50 (09/10), <i>Gateway Control Protocol: NAT traversal toolkit packages</i> .  |
| [ITU-T H.248.64] | Recommendation ITU-T H.248.64 (12/09), <i>Gateway Control Protocol: IP router packages</i> .  |
| [ITU-T H.248.81] | Recommendation ITU-T H.248.81 Amendment 1 (13/xx), <i>Gateway Control Protocol: Guidelines on the use of the international emergency preference scheme (IEPS) call indicator and priority indicator in ITU-T H.248 profiles</i> . |
| [IETF RFC 3168]  | IETF RFC 3168 (2001), <i>The Addition of Explicit Congestion Notification (ECN) to IP</i> .   |

|                 |   |
|-----------------|---|
| [IETF RFC 3550] | IETF RFC 3550 (2003), <i>RTP: A Transport Protocol for Real-Time Applications</i> .   |
| [IETF RFC 3611] | IETF RFC 3611 (2003), <i>RTP Control Protocol Extended Reports (RTCP XR)</i> .  |
| [IETF RFC 4585] | IETF RFC 4585 (2006), <i>Extended RTP Profile for Real-time Transport Control Protocol (RTCP)-Based Feedback (RTP/AVPF)</i> .                                   |
| [IETF RFC 5245] | IETF RFC 5245 (2010), <i>Interactive Connectivity Establishment (ICE): A Protocol for Network Address Translator (NAT) Traversal for Offer/Answer Protocols</i> |
| [IETF RFC 5506] | IETF RFC 5506 (2009), <i>Support for Reduced-Size Real-Time Transport Control Protocol (RTCP): Opportunities and Consequences</i> .                             |
| [IETF RFC 6679] | IETF RFC 6679 (2012), <i>Explicit Congestion Notification (ECN) for RTP over UDP</i> .  |

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## 3 Definitions

### 3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

**3.1.1 Sender** [IETF RFC 6679]: A sender of RTP packets carrying an encoded media stream. The sender has the possibility to effect how this transmission is performed. It is one end-point of the ECN control loop.

NOTE 1 - the sender in this sense may or may not be the same as the RTP End System.

**3.1.2 Receiver** [IETF RFC 6679]: A receiver of RTP packets with the intention to consume the media stream. It sends RTCP feedback on the received stream. It is the other end-point of the ECN control loop.

NOTE 2 - the receiver in this sense may or may not be the same as the RTP End System.

### 3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

**3.2.1 AuditValue.req:** A H.248.1 AuditValue command request.

---

## 4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

|       |                                      |
|-------|--------------------------------------|
| ABNF  | Augmented Backus Naur Format         |
| B2BIH | Back-to-Back Internet protocol Host  |
| B2BRE | Back-to-Back RTP End system.         |
| CE    | Congestion Experienced               |
| DCCP  | Datagram Congestion Control Protocol |
| ECN   | Explicit Congestion Notification     |
| ECT   | ECN Capable Transport                |

|      |                                      |
|------|--------------------------------------|
| ETS  | Emergency Telecommunications Service |
| IP   | Internet Protocol                    |
| IPR  | Internet Protocol Router             |
| LD   | Local Destination                    |
| LS   | Local Source                         |
| Lx   | Layer number                         |
| MCU  | Media Control Unit                   |
| MG   | Media Gateway                        |
| MGC  | Media Gateway Controller             |
| MSRP | Message Sending Relay Protocol       |
| RD   | Remote Destination                   |
| RS   | Remote Source                        |
| RTP  | Real Time Protocol                   |
| RTCP | RTP Control Protocol                 |
| SCTP | Stream Control Transport Protocol    |
| SDP  | Session Description Protocol         |
| SIP  | Session Initiation Protocol          |
| SSRC | Synchronization Source               |
| UDP  | User Datagram Protocol               |

---

## 5 Conventions

Elements of the H.248 protocol model, e.g. Context, Termination, Stream, Event are represented using the first letter capitalised. H.248 Property, Event, Signal and Parameter identities are given in *italics*. When used in the main text SDP syntax is highlighted in bold i.e. “**m=**”.

---

## 6 Use of ECN with H.248

H.248 entities (MG, MGC) may be involved with ECN in multiple ways. Clause 6.1 introduces the basic control principle. Subsequent clauses illustrate example IP transport (and possibly application) protocol specific use of ECN with H.248.

### 6.1 Basic ECN control loop

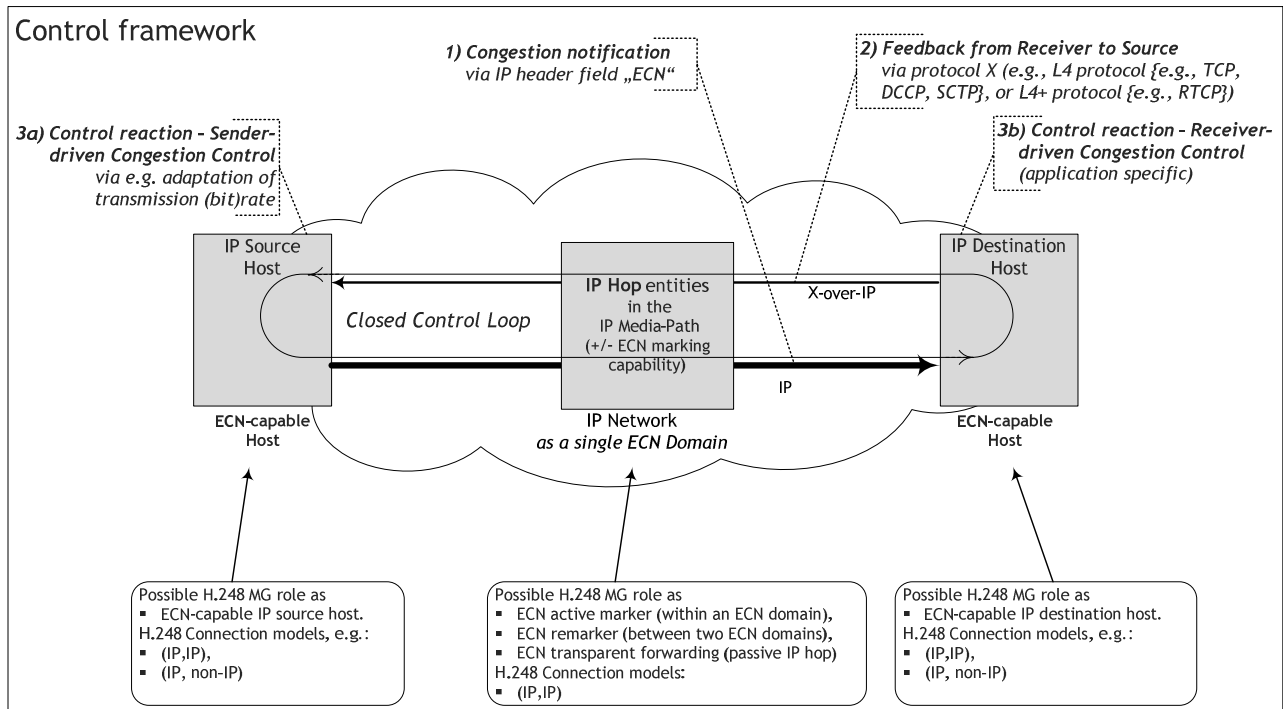
[IETF RFC 3168] defines an addition to IP for ECN support. This support relates to a unidirectional connection model, i.e., IP traffic in IP source host to IP destination host direction. Figure 1 illustrates the basic ECN control principle. The control loop may be abstracted by four components in the user plane:

1. the *congestion notification information* flow in source to destination host direction;
2. the *feedback information* flow in reverse direction, back to the traffic source;

3. the *actuating elements* in case of indicated congestion (typically located in the source host); and
4. the *sensor elements*, responsible for indicating congestion (at a network route, in an IP hop) by ECN marking in the IP path.

There might be a further component in the control plane for:

5. the indication and negotiation of a congestion control.



NOTE – The thick arrow shows the unidirectional IP packet path (where hop entities may provide ECN-CE marking). The thin arrow in reverse direction indicates protocol X packets in feedback direction.

**Figure 1 – ECN supporting IP network (H.248 bearer plane) – Basic model of the ECN control loop**

In Figure 1 the control loop spans two ECN-capable IP host entities with information flows in both directions, requiring a bidirectional communication path. There are different protocols in use for ECN (Figure 1) in each direction:

- IPv4 or IPv6 in the source-to-destination host direction for carrying ECN indications;
  - Higher layer protocols in the reverse direction. This is normally the applied IP transport protocol if extended (like TCP) or designed for ECN support (like DCCP, SCTP); or a L4+ protocol (like RTCP in case of UDP transport).
- H.248 MG entities may be involved in ECN control loops in various ways. There may be potential use cases for all four of the above indicated protocol groups to be involved in the control loop. Figure 1 outlines some possible MG roles.

## 6.2 Use of ECN with TCP traffic

TCP relates to a bidirectional transport connection, allowing the use of TCP control elements for the ECN feedback path. The use of ECN with TCP is defined in clause 6 of [IETF RFC 3168]. It is achieved primarily by the use of two additional TCP header flags. Figure 2 illustrates the control model of the use of ECN with TCP traffic.

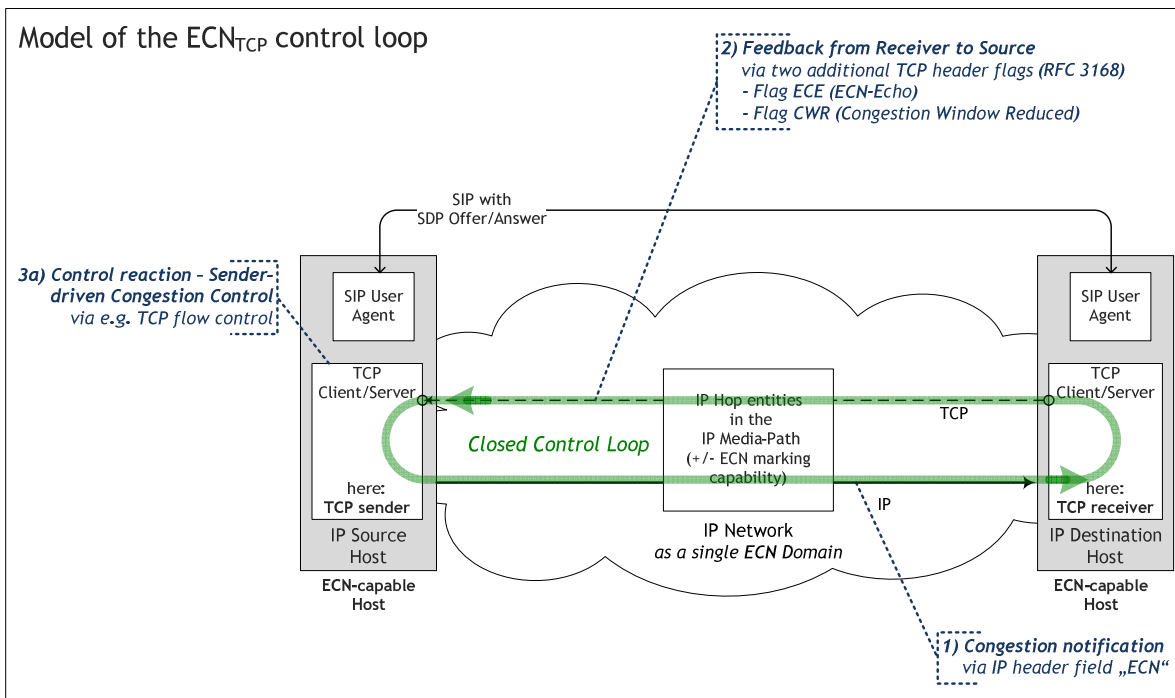


Figure 2 – Use of ECN with TCP traffic

Use of ECN with TCP is relevant for H.248 MGs with TCP-based streams (e.g. used for MSRP-over-TCP based transport of Instant Messaging traffic).

### 6.3 Use of ECN with RTP-over-UDP traffic

UDP is a connectionless transport protocol, lacking control elements for carrying ECN feedback in the UDP header. The ECN feedback information path is thus delegated to higher layer protocols, e.g. RTCP in case of RTP-over-UDP sessions. Figure 3 summarizes the ECN solution framework as defined by [IETF RFC 6679].

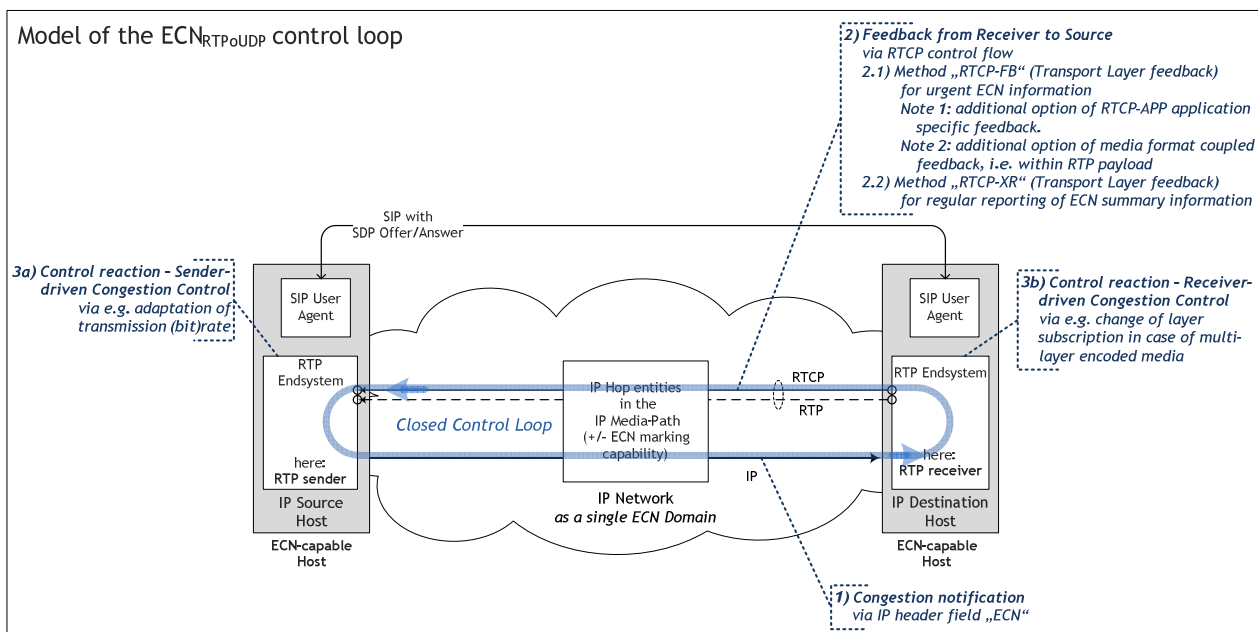
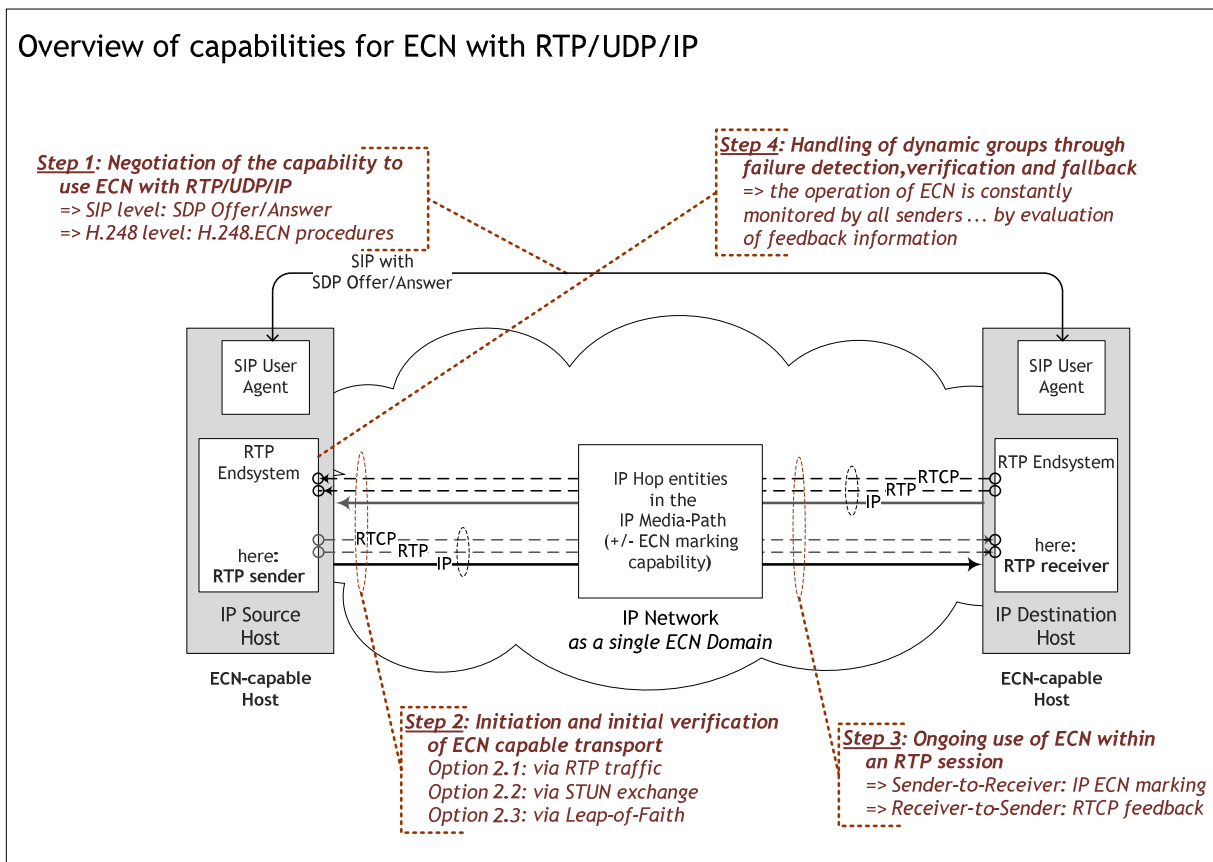


Figure 3 – Use of ECN with RTP-over-UDP traffic

There are multiple deployment scenarios, given interim NAT devices, NAT-traversal support functions or “middlebox” behaviour in the ECN IP path, as well as control plane options for RTP session control (see next clause). Figure 4 summarizes the procedures defined by [IETF RFC 6679].



**Figure 4 – Procedures for use of ECN with RTP-over-UDP traffic**

## 6.4 Capability declaration and negotiation of ECN in the control plane

There are multiple options of control plane protocols (e.g., H.323, SIP, SIP-I) for the establishment and release of RTP sessions. Figures 3 and 4 indicate the example of SIP with its embedded SDP Offer/Answer protocol, used for end-to-end capability declaration and negotiation of ECN usage.

[IETF RFC 6679] assumes the use of a SIP based control plane with additional SDP information elements.

Figure 5 outlines an example scenario in scope of this Recommendation, e.g., SIP as session control signalling protocol at MGC level, and the mapping of SIP-level SDP information to H.248 control elements, and an H.248 MG, which may provide various ECN behaviour (as outlined in clauses 6.1 and 6.5).

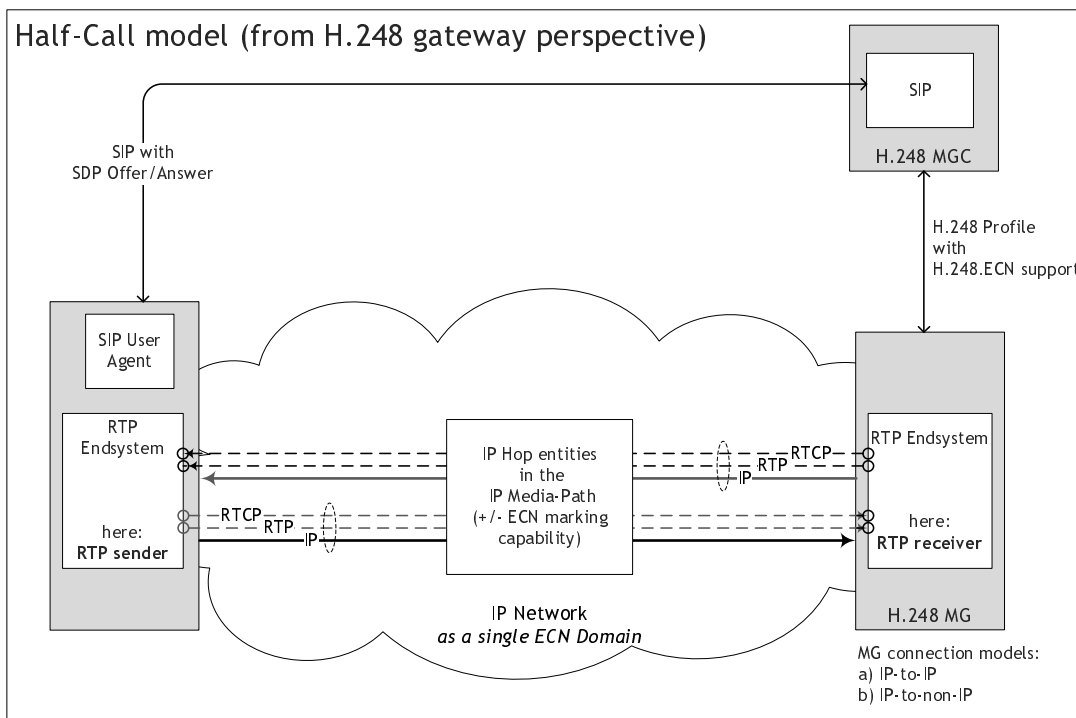


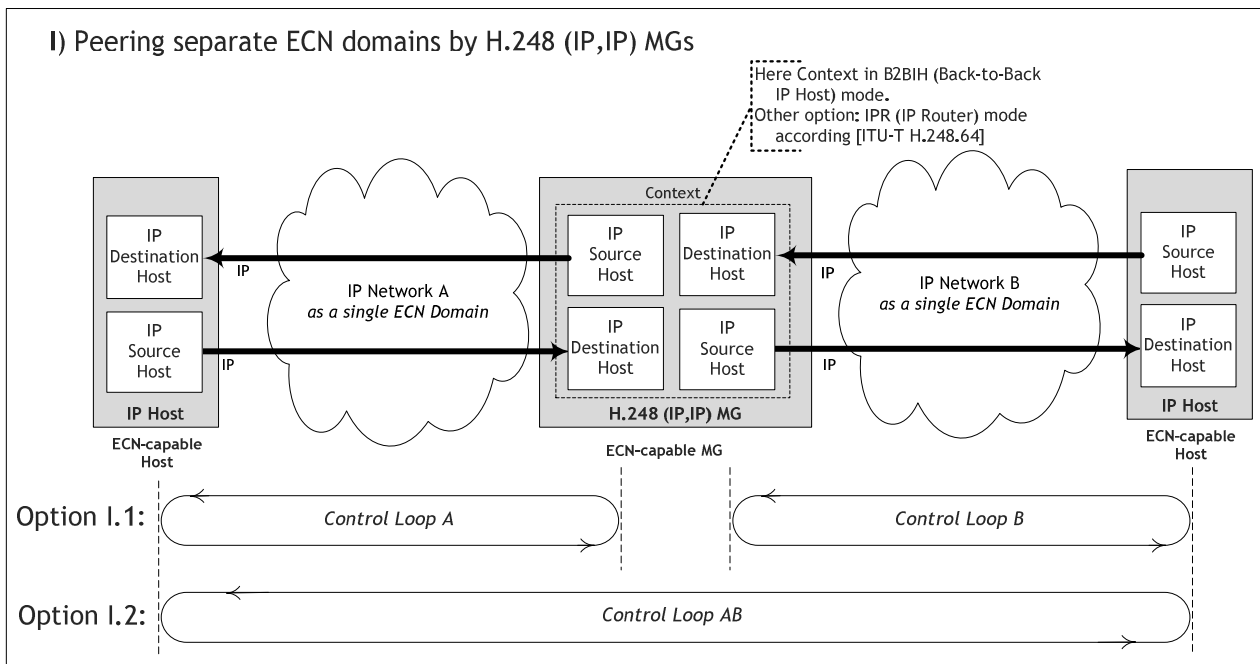
Figure 5 – Control plane example with H.248 network elements at the edge of an ECN domain

## 6.5 ECN interworking scenarios

For traffic and network engineering of IP networks with regards to ECN domains, the H.248 MG may play the role of an ECN-capable IP host endpoint or be located within the ECN IP path, as introduced in clause 6.1. ECN defines multiple code points for ECN marking in case of ECN Capable Transport (ECT), termed as ECT(0), ECT(1) and ECT(random) code points.

For traffic and network engineering of IP networks with regards to ECN domains, the ECT code point options and the various possible MG behaviours may lead to different ECN interworking scenarios. Some basic network configurations are illustrated below.

Figure 7 provides the example of a peering scenario. For instance, there may be different ECT code points in use in each ECN domain. The H.248 MG may then be requested to remark ECN code points in case of the end-to-end ECN control loop approach (option I.2 below).

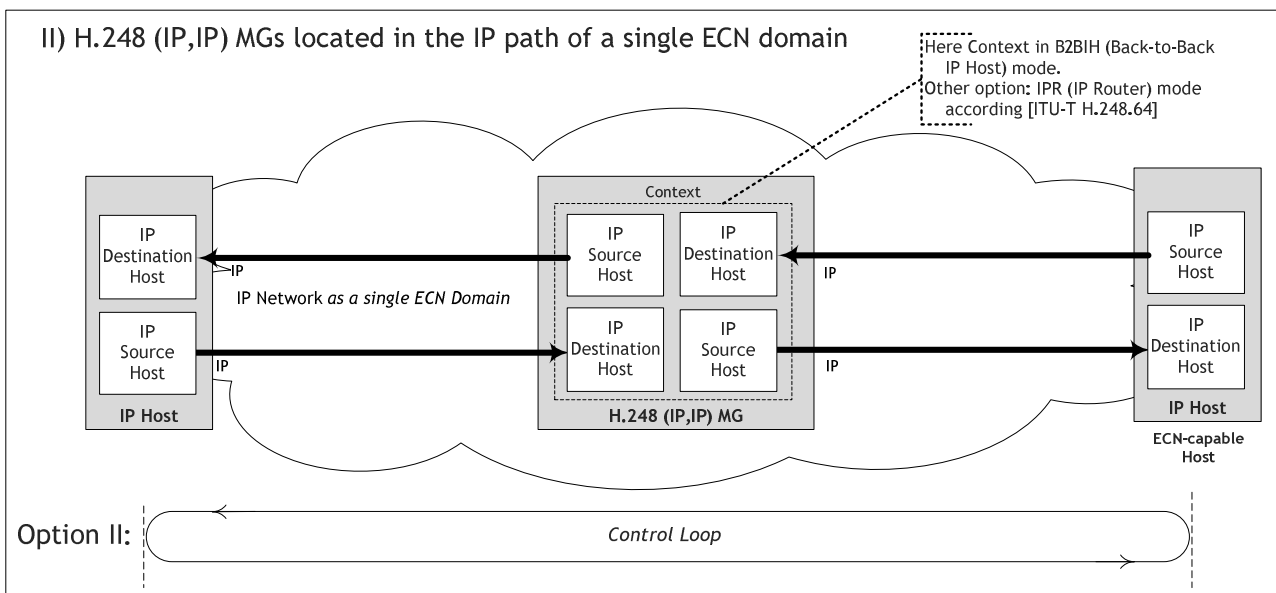


NOTE – The IP topologies are basically associated with the H.248 Stream level. Above figure illustrates an example on Context level (referred to the IP topology models according clause 3.2.1 (B2BIH) and clause 6.5.1 (IP router) of [ITU-T H.248.64]).

**Figure 6 – Peering separate ECN domains by H.248 (IP,IP) MGs**

Each ECN domain may be also completely separated by limiting the control loops on each domain (option I.1).

Figure 8 illustrates another configuration, the example of an H.248 (IP,IP) MG located within the IP path of a single ECN domain.



**Figure 7 – H.248 (IP,IP) MGs located in the IP path of a single ECN domain**

The H.248 MG may be required to enforce different ECN support behaviour, like transparent forwarding of ECN information in IP headers, or the active marking of ECN bits due to “local congestion information”, or the reading and collecting of ECN information for local H.248 statistics, etc.



## 6.6 Possible interactions of ECN with other services

See Appendix II concerning considerations between ECN and ETS interactions.

---

# 7 ECN for RTP-over-UDP Support Package

|                      |   |
|----------------------|---|
| <b>Package Name:</b> | ECN for RTP-over-UDP Support Package  |
| <b>Package ID:</b>   | ecnrous (0x010b)  |
| <b>Description:</b>  | This package allows a MGC to indicate to a MG that it shall support Explicit Congestion Notification (ECN) for RTP over UDP (as defined by [IETF RFC 6679]) on a particular Termination / Stream. |
| <b>Version:</b>      | 1   |
| <b>Extends:</b>      | None.   |

## 7.1 Properties

### 7.1.1 ECN Enabled

|                         |   |
|-------------------------|---|
| <b>Property Name:</b>   | ECN Enabled   |
| <b>Property ID:</b>     | ecnen (0x0001)  |
| <b>Description:</b>     | This property allows the MGC to indicate whether or not ECN is enabled on a Stream. |
| <b>Type:</b>            | Boolean   |
| <b>Possible values:</b> | True ECN is enabled<br>False ECN is not enabled                                     |
| <b>Default:</b>         | False.  |
| <b>Defined in:</b>      | Local/Remote  |
| <b>Characteristics:</b> | Read/Write  |

### 7.1.2 Congestion Response Method

|                         |   |
|-------------------------|---|
| <b>Property Name:</b>   | Congestion response method  |
| <b>Property ID:</b>     | crm (0x0002)  |
| <b>Description:</b>     | When RTP packets are received with ECN-CE marks from the remote side or local congestion is experienced, the sender and/or receivers MUST react with congestion control as-if those packets had been lost. However there are different control methods which a MG could use. This property allows the MGC to request different types of control. These types are defined in clause 7.3.3 / [IETF RFC 6679]. |
| <b>Type:</b>            | Enumeration   |
| <b>Possible values:</b> | "SDCC" (0x0001) Sender Driven Congestion Control<br>"RDCC" (0x0002) Receiver Driven Congestion Control<br>"Hybrid" (0x0003) A hybrid mechanism  |

The value "Hybrid" requires additional MG behaviour description which is outside the scope of this Recommendation. This could be specified within an application profile.

**Default:** Provisioned.

**Defined in:** Local/Remote

"SDCC" in Local Descriptor implies the MG, when receiving ECN-CE marked media, generates ECN feedback towards the sender of the media.

"RDCC" in Local Descriptor implies the MG reacts to the received ECN-CE marks without contacting the sender. NOTE: as a result of the action taken by the MG, the sender is eventually notified, for example of a change of subscription to a less bandwidth consuming layer or through bit adaptation requests.

"SDCC" in Remote Descriptor implies ECN feedback may be received from the remote receiver and the MG shall react to this feedback for example with bit adaptation requests.

"RDCC" in Remote Descriptor requires no action from the MG.

**Characteristics:** Read/Write

### 7.1.3 Initiation Method

**Property Name:** Initiation Method

**Property ID:** initmethod (0x0003)

**Description:** This property indicates which ECN initiation method is to be used. This property is equivalent to the "init-value" defined by the ABNF grammar defined by clause 6.1/ [IETF RFC 6679].

If the MGC requires that the MG choose the any appropriate initiation value it shall provide the list of possible value as an over specified list.

**Type:** String

**Possible values:** As per "init-value" in clause 6.1/ [IETF RFC 6679].

"rtp", "ice" or "leap".

This package also defines an additional value "inactive" that may be used with this property or for the "init-value" parameter if SDP is used. "Inactive" indicates that no ECN initiation is performed (and thus the ECN procedures in clause 7.6.3.1 do not apply) for the particular RTP stream.

**Default:** Provisioned.

**Defined in:** Local/Remote

**Characteristics:** Read/Write

### 7.1.4 ECN Mode

**Property Name:** ECN Mode

**Property ID:** mode (0x0004)

**Description:** The ECN Mode parameter as defined in [IETF RFC 6679] describes an endpoint's ability to set and read ECN marks in UDP packets. Thus it describes a bi-directional flow.

The ECN mode property in this package indicates whether the MG should set

and/or read ECN marks. This property is equivalent to "mode" defined by the ABNF grammar defined by clause 6.1 / [IETF RFC 6679]. However the mode information is set in both the Local and Remote Descriptors and is thus unidirectional.

The property refers to the mode that the MG shall operate in order to determine the correct ECN procedures to apply. The MG specific semantic is detailed below.

**Type:** Enumeration

**Possible values:** As per "mode" clause 6.1 / [IETF RFC 6679] with the exception that the value "setread" is not signalled by the MGC to the MG. Where an MGC requires "setread" behaviour it shall set "setonly" in the Remote Descriptor and "readonly" in the Local Descriptor.

|                     |  |
|---------------------|--|
| "setonly" (0x0001)  | This value is set in the Remote Descriptor and indicates that ECN marks may be set on this Stream.   |
| "readonly" (0x0002) | This value is set in the Local Descriptor and indicates that ECN marks may be read from this Stream. |

**Default:** In order to correspond to the [IETF RFC 6679] ECN Mode default ("setread"), the default setting of this property is "setonly" in the Remote Descriptor and "readonly" in the Local Descriptor.

**Defined in:** Local / Remote

**Characteristics:** Read/Write

## 7.1.5 ECT Marking

**Property Name:** ECT Marking

**Property ID:** ectmark (0x0005)

**Description:** When set in the Remote Descriptor this property indicates how the MG should set ECN marks. When set in the Local Descriptor this property indicates which ECN mark is expected from the remote sender (NOTE 1). The expected value however does not usually influence the MG behaviour, even in the case that it doesn't correspond to the value actually received. This property is equivalent to the "ect" element defined by the ABNF grammar defined by clause 6.1 / [IETF RFC 6679].

NOTE 1 – There is also an ECN-CE marking function (besides ECT marking), which may be supported by H.248 MGs and interim IP devices. Such marking due to experienced local congestion is out of scope of this property.

**Type:** Enumeration

**Possible values:** As per "ect" clause 6.1 / [IETF RFC 6679]:  
 "1" (0x0001)  
 "0" (0x0002)  
 "Random" (0x0003)

**Default:** "0".

**Defined in:** Local / Remote

**Characteristics:** Read/Write

## 7.1.6 ECN Congestion Marking

**Property Name:** ECN Congestion Marking

|                         |   |
|-------------------------|---|
| <b>Property ID:</b>     | congestmark (0x0006)  |
| <b>Description:</b>     | This property allows the MGC to indicate whether or not RTP packets may be ECN-CE marked by the MG (or not) if it the MG itself experiences congestion.   |
| <b>Type:</b>            | Enumeration   |
| <b>Possible values:</b> | "mgdet" (0x0001): The MG determines if ECN Congestion Marking is enabled.<br>"cemark" (0x0002): ECN Congestion marking is enabled.<br>"nomark" (0x0003): ECN Congestion marking is not enabled. |
| <b>Default:</b>         | Provisioned.  |
| <b>Defined in:</b>      | Local / Remote<br><br>NOTE: the property is irrelevant when included in the Local Descriptor.   |
| <b>Characteristics:</b> | Read Only   |

## 7.1.7 ECN SDP Usage

|                         |  |
|-------------------------|--|
| <b>Property Name:</b>   | ECN SDP Usage  |
| <b>Property ID:</b>     | ecnsdp (0x0007)  |
| <b>Description:</b>     | This property allows the MGC to determine which method for signalling the ECN "initiation method", "mode" and "ect marking" the MG supports. The MGC may then use any method that the MG supports. |
| <b>Type:</b>            | Enumeration  |
| <b>Possible values:</b> | "P" (0x0001)           The properties in clauses 7.1.1, 7.1.3, 7.1.4 and 7.1.5.<br>"S" (0x0002) The SDP " <b>a=ecn-capable-rtp</b> " attribute.<br>"B" (0x0003) Either of the above two methods.   |
| <b>Default:</b>         | Provisioned.   |
| <b>Defined in:</b>      | Termination State (Root Termination Only)  |
| <b>Characteristics:</b> | Read Only  |

## 7.2 Events

### 7.2.1 ECN Failure

|                     |  |
|---------------------|--|
| <b>Event Name:</b>  | ECN Failure  |
| <b>Event ID:</b>    | fail (0x0001)  |
| <b>Description:</b> | This event indicates that ECN has failed on the indicated StreamID. The event may be set at a Termination or Stream level. The ObservedEvent shall return the StreamID of where the ObservedEvent was detected. The MG shall return the failure type. The MG may optionally return the path that has failed. |

#### 7.2.1.1 EventsDescriptor parameters

None.

## 7.2.1.2 ObservedEventsDescriptor parameters

### 7.2.1.2.1 Failure Type

|                         |  |
|-------------------------|--|
| <b>Parameter Name:</b>  | Failure Type   |
| <b>Parameter ID:</b>    | type (0x0001)  |
| <b>Description:</b>     | This parameter indicates at what stage ECN has failed. A failure may occur during the transport level initiation phase or during the ongoing use phase. A failure during the initiation phase indicates a problem with the signalling used for the initiation of ECN. A failure during the ongoing use phase indicates that whilst ECN was successfully negotiated, the continued use of ECN is causing problems. The detection of failures during ongoing use is described in clause 7.4 / [IETF RFC 6679]. |
| <b>Type:</b>            | Enumeration  |
| <b>Optional:</b>        | No   |
| <b>Possible values:</b> | INIT (0x0001): Failure during initiation Phase<br>USE (0x0002): Failure during ongoing use phase   |
| <b>Default:</b>         | None.  |

### 7.2.1.2.2 Media Sender SSRC

|                         |  |
|-------------------------|--|
| <b>Parameter Name:</b>  | Media Sender SSRC  |
| <b>Parameter ID:</b>    | ssrc (0x0002)  |
| <b>Description:</b>     | This parameter contains the SSRC of the media sender with whom ECN has failed.             |
| <b>Type:</b>            | Integer  |
| <b>Optional:</b>        | Yes  |
| <b>Possible values:</b> | SSRC as per [IETF RFC 3550].   |
| <b>Default:</b>         | None. If not sent it indicates all media senders associated with the StreamID have failed. |

## 7.3 Signals

None.

## 7.4 Statistics

### 7.4.1 Source (SSRC)

|                         |   |
|-------------------------|---|
| <b>Statistic Name:</b>  | Source  |
| <b>Statistic ID:</b>    | ssrc (0x0001)   |
| <b>Description:</b>     | This statistic provides a list of RTP sources associated with the Stream. |
| <b>Type:</b>            | Sub-list of integer   |
| <b>Possible values:</b> | SSRC as per [IETF RFC 3550].  |
| <b>Level:</b>           | Stream  |

## 7.4.2 CE Counter

|                         |  |
|-------------------------|--|
| <b>Statistic Name:</b>  | CE Counter   |
| <b>Statistic ID:</b>    | cecount (0x0002)   |
| <b>Description:</b>     | This statistic provides the number of RTP packets received so far in the session with an ECN field set to CE for a particular SSRC within the Stream. Each position of the sub-list is associated with a SSRC at related position in the <i>ssrc</i> statistic. See clause 7.4.2 / [IETF RFC 6679] for more details. |
| <b>Type:</b>            | Sub-list of double   |
| <b>Possible values:</b> | 0 and upwards.   |
| <b>Level:</b>           | Stream   |

## 7.4.3 ECT 0 Counter

|                         |   |
|-------------------------|---|
| <b>Statistic Name:</b>  | ECT0 Counter  |
| <b>Statistic ID:</b>    | ectzero (0x0003)  |
| <b>Description:</b>     | This statistic provides the number of RTP packets received so far in the session with an ECN field set to ECT (0) for a particular SSRC within the Stream. Each position of the sub-list is associated with a SSRC at related position in the <i>ssrc</i> statistic. See clause 7.4.2 / [IETF RFC 6679] for more details. |
| <b>Type:</b>            | Sub-list of double  |
| <b>Possible values:</b> | 0 and upwards.  |
| <b>Level:</b>           | Stream  |

## 7.4.4 ECT 1 Counter

|                         |   |
|-------------------------|---|
| <b>Statistic Name:</b>  | ECT1 Counter  |
| <b>Statistic ID:</b>    | ectone (0x0004)   |
| <b>Description:</b>     | This statistic provides the number of RTP packets received so far in the session with an ECN field set to ECT (1) for a particular SSRC within the Stream. Each position of the sub-list is associated with a SSRC at related position in the <i>ssrc</i> statistic. See clause 7.4.2 / [IETF RFC 6679] for more details. |
| <b>Type:</b>            | Sub-list of double  |
| <b>Possible values:</b> | 0 and upwards.  |
| <b>Level:</b>           | Stream  |

## 7.4.5 Not-ECT Counter

|                        |   |
|------------------------|---|
| <b>Statistic Name:</b> | Not-ECT Counter   |
| <b>Statistic ID:</b>   | notetc (0x0005)   |
| <b>Description:</b>    | This statistic provides the number of RTP packets received so far in the session with an ECN field set to not-ECT for a particular SSRC within the Stream. Each position of the sub-list is associated with a SSRC at related position in the <i>ssrc</i> statistic. See clause 7.4.2 / [IETF RFC 6679] for more details. |
| <b>Type:</b>           | Sub-list of double  |

**Possible values:** 0 and upwards.

**Level:** Stream

## 7.4.6 Lost Packets Counter

**Statistic Name:** Lost Packets Counter

**Statistic ID:** lost (0x0006)

**Description:** This statistic provides the number of RTP packets that are expected minus the number received for a particular SSRC within the Stream. Each position of the sub-list is associated with a SSRC at related position in the *ssrc* statistic. See clause 7.4.2 / [IETF RFC 6679] for more details.

**Type:** Sub-list of double

**Possible values:** 0 and upwards.

**Level:** Stream

## 7.4.7 Extended Highest Sequence number

**Statistic Name:** Extended Highest Sequence number

**Statistic ID:** ehsn (0x0007)

**Description:** This statistic provides the highest sequence number seen when sending this report, but with additional bits, to handle disambiguation when wrapping the RTP sequence number field for a particular SSRC within the Stream. Each position of the sub-list is associated with a SSRC at related position in the *ssrc* statistic. See clause 7.4.2 / [IETF RFC 6679] for more details.

**Type:** Sub-list of integer

**Possible values:** 0 and upwards.

**Level:** Stream

## 7.4.8 Duplication Counter

**Statistic Name:** Duplication Counter

**Statistic ID:** dup (0x0008)

**Description:** This statistic provides the cumulative number of RTP packets received that are a duplicate of an already received packet from this SSRC since the receiver joined the RTP session. Each position of the sub-list is associated with a SSRC at related position in the *ssrc* statistic. See clause 7.4.2 / [IETF RFC 6679] for more details.

**Type:** Sub-list of integer

**Possible values:** 0 and upwards.

**Level:** Stream

## 7.5 Error Codes

None.

## 7.6 Procedures

### 7.6.1 RTP topology

ECN functionality may be used with different RTP session topologies. The ECN behaviour in conjunction with certain RTP topologies is described in clause 3.2 / [IETF RFC 6679]. Through the MGC setting the combination of Terminations/Streams in a Context, the properties in the "ECN for RTP-over-UDP Support" and other elements in the Local and Remote Descriptors the MG is able to determine the correct ECN behaviour.

### 7.6.2 Negotiation of the capability to use ECN with RTP/UDP/IP

As per [IETF RFC 6679] a MG supporting ECN with RTP/UDP/IP requires different RTCP extensions:

- RTP/AVPF [IETF RFC 4585] transport layer feedback format for urgent ECN information,
- RTCP XR [IETF RFC 3611] ECN summary report block type for regular reporting of the ECN marking information.

Thus in addition to the methods for indicating/negotiating ECN described below the MGC may need to send other information (i.e. SDP "m=" and "a=" lines) indicating the support of RTP/AVPF [IETF RFC 4585] and RTCP XR [IETF RFC 3611] as well as the appropriate address information for the Stream.

**NOTE** - In some cases (i.e. where timely feedback is not required and usage of the leap of faith initialization method) transport layer feedback for urgent ECN information may not be required. See clause 3.3 / [IETF RFC 6679] for further information on the need for transport layer feedback. In order to be notified of failures the MGC shall also set the "ECN failure" (*ecnrous/fail*) event.

If the MGC requires information regarding the use of ECN the MGC should set the "Source" (*ecnrous/ssrc*), "CE Counter" (*ecnrous/cecount*), "ECT 0 Counter" (*ecnrous/zero*), "ECT 1 Counter" (*ecnrous/ectone*), "Not-ECT Counter" (*ecnrous/notetc*), "Lost Packets Counter" (*ecnrous/lost*) and the "Extended Highest Sequence Number" (*ecnrous/ehsn*) Statistics. Alternatively, for packet loss counters, the statistics defined in the RTP package [ITU-T H.248.1] can be used.

[ITU-T H.248.47] provides a means to dynamically discover the values of statistics. However [ITU-T H.248.47] is only applicable where a statistic has a single value. It does not support statistics with type "list of". Thus if [ITU-T H.248.47] is used with the statistics in this Recommendation it shall be used in the case that a statistic relates to a single SSRC.

#### 7.6.2.1 Signalling ECN Capability

In order to use ECN, the use of ECN needs to be enabled and information regarding the "initiation method", "ecn mode" and "ect marking" needs to be determined. These may be communicated to the MG either utilising the "ECN Enable" (*ecnrous/en*), "Initiation Method" (*ecnrous/initmethod*), "ECN Mode" (*ecnrous/mode*) and "ECT Marking" (*ecnrous/ectmark*) properties or via the use of the "**a=ecn-capable-rtp**" SDP attribute as defined in clause 6.1 / [IETF RFC 6679]. The MGC can determine which method is supported via an audit of the "ECN SDP Usage" (*ecnrous/ensdp*) property. Alternatively, the supported method may be provisioned. For the property based signalling method any property that has a provisioned value does not need to be sent for the relevant Stream. For the SDP based method the MGC shall include a CHOOSE wildcard for the particular information element in question.

In order to utilise the RTCP ECN feedback and the RTCP XR block for ECN summary the use of these should be indicated as per clauses 6.2 and 6.3 / [IETF RFC 6679].

If the MGC requires that the MG apply a particular congestion control method as a result of the reception of ECN-CE marked RTP packets it shall send the "Congestion Response Method" (*ecnrous/crm*) property to the MG with the required value.

Furthermore the MGC may also control through the use of the "ECN Congestion Marking" (*ecnrous/congestmark*) property whether or not RTP packets may be ECN-CE marked by the MG (or not) if it the MG itself experiences congestion.

The above properties are defined for use in the Local and Remote Descriptors as these are related to stream resources which need to be reserved on a per stream basis. H.248 Streams are bi-directional in nature with one direction described by the Local Descriptor and the other via the Remote Descriptor. This allows an asymmetric usage of ECN. However



for a typically bi-directional use case, symmetric usage with the parameters placed in both the Local and Remote Descriptors may be assumed.

When ECN is used in both the sending and receiving direction the *ecnrous/mode* is set to “readonly” in the Local Descriptor and to “setonly” in the Remote Descriptor. The *ecnrous/ecnen* is set to TRUE in both descriptors.

When ECN is only used in the receiving direction the *ecnrous/mode* is set to “readonly” in the Local Descriptor. The *ecnrous/ecnen* is set to TRUE in the Local Descriptor and to FALSE in the Remote Descriptor.

When ECN is only used in the sending direction the *ecnrous/mode* is set to “setonly” in the Remote Descriptor. The *ecnrous/ecnen* is set to TRUE in the Remote Descriptor and to FALSE in the Local Descriptor.

### 7.6.2.2 ICE Parameter to Signal ECN Capability

As per clause 6.4 / [IETF RFC 6679] an Internet Connectivity Exchange (ICE) [IETF RFC5245] flag may be used to indicate ECN support for ICE. However it is assumed that this attribute is used between MGCs when they have knowledge that the MG supports ECN functionality. This may be known through provisioning or an Audit of the Packages Descriptor indicating the support of the "ECN Package".

### 7.6.3 Initiation and initial verification of ECN capable transport

The use and initiation of ECN on a Termination / Stream is mainly determined via the setting of "ECN Enabled" equal to "True" on a Termination/Stream in combination with an "Initiation Method". [IETF RFC 6679] defines three initiation methods "rtp", "ice" and "leap". This package defines an additional method "inactive" which indicates that ECN initiation procedures should not be started. Other properties may be examined in the Local and Remote Descriptors to determine media handling that may have an impact on ECN procedures and error handling. For example to determine:

- If there is a change in packetisation (segmentation/reassembly),
- If there is transcoding.

**NOTE -** As per [IETF RFC 6679] a transcoding scenario requires the use of ECN properties to split the ECN connection in two parts, each with its own negotiation.

If "ECN Enabled" equal to "True" and "Initiation Method" equal to "inactive" (either by default or specification) is set on the same stream (and direction) on both Terminations of a Context with no other ECN related properties set then the MG shall not perform ECN initiation. It shall behave as an ECN aware MG and copy ECN bits (including CE information) from ingress packets to the egress one.

If "ECN Enabled" equal to "True" and "Initiation Method" equal to "inactive" (either by default or specification) is set on the same stream (and direction) on both Terminations of a Context with no other ECN related properties set, but the MG performs packet segmentation or reassembly, without media transcoding, the MG derives ECT and ECN-CE marks in the egress stream from the corresponding ones in the ingress stream, as specified in [IETF RFC 6679].

If "ECN Enabled" is equal to "True", "Initiation Method" is set a value other than "inactive" and other ECN related properties are set then the MG shall perform ECN initiation and processing. The Termination at which these properties are set shall behave as an ECN endpoint, i.e. it shall not pass ECT markings transparently to its egress even if the corresponding termination has identical stream properties.

**NOTE -** The MGC may determine that ECN processing is required as a result of the need for transcoding. [IETF RFC 6679] indicates that where transcoding occurs, a middlebox (i.e. the MG) shall process ECN as separate ECN Endpoints. ECN processing may also be required due to independent ECN negotiation at the call control layer, independent of transcoding.

ECN processing may also be triggered by setting "ECN Enabled" equal to "True" on a single Termination/Stream and "ECN Enable" equal to "False" on the opposite Termination/Stream. If behaviour other than the specified default behaviour is required the properties in this package related to that behaviour shall be signalled.

**NOTE -** The support of clause 7.2.2 / [IETF RFC 6679] is FFS. [ITU-T H.248.50] supports STUN and ICE but does not support an ECN field.

As per clause 7.2.1 / [IETF ECN] the transport level negotiation of ECN may be unsuccessful and this should be logged. The ECN failure event (*ecnrous/fail*) with failure type "INIT" is used to indicate this to the MGC.

## 7.6.4 Ongoing use of ECN within an RTP session

### 7.6.4.1 ECN Initiated

Once the MG has initiated ECN it shall operate according to clause 7.3 / [IETF RFC 6679]. If reduced size RTCP [IETF RFC5506] is to be used this should be indicated (via "**a=rtcp-rsize**") this should be signalled as part of clause 6.1.

When RTP packets are received with ECN-CE marks, senders and/or receivers shall react with an appropriate congestion control. One of several different types of congestion control may be used (see clause 7.3.3 / [IETF RFC 6679]). When the MG receives RTP packets with ECN-CE marks it should act according to the type specified in the "Congestion Response Method" (*ecnrous/crm*) property.

On receipt of the RTP packets with ECN-CE marks if the MGC has previously requested notification of this (via [ITU-T H.248.47], see clause 7.6.2 above) and the relevant criteria is met then the MG shall notify the MGC of this ObservedEvent.

### 7.6.4.2 No ECN Initiated

If no ECN initiation was performed the MG shall continue to operate according to clause 7.6.2 as per cases where "Initiation Method" equals "inactive".

## 7.6.5 Handling of dynamic groups through failure detection, verification and fallback

When detecting failures the MG should operate according to clause 7.4, 7.4.1 and 7.4.2 / [IETF RFC 6679]. This allows the MG to act autonomously to congestion, high packet loss rate and other failures without the need for interaction with a MGC. However if the MG determines that the use of ECN should be disabled it should indicate this to the MGC via the ECN failure event (*ecnrous/fail*) with type set to "USE"; the criteria for the MG to determine this is outside this Recommendation.

Associated with ECN are summary reports that may be used to detect various types of ECN path issues. These reports are per source SSRC and contain the following information: CE counter, ECT (0/1) counters, not-ECT Counter, Lost Packets counter, Extended Highest Sequence number and Duplication Counter. For more information see clause 7.4.2 / [IETF RFC 6679]. The MG sends these reports to its peer using RTCP. The MGC may also request this information for its own purposes, which are outside this Recommendation. In order to make this information available to a MGC this information is recorded in H.248 statistics. Thus if the MGC requires this information, it should set the statistics during the capability negotiation phase (see clause 6.1). The MGC may then perform an AuditValue.req on the statistics. In order to support multiple SSRCs per Stream the values of the Statistics are in a sub-list form. The values in a certain sub-list position are relative to each other across all the statistics in the ECN package.

## 7.6.6 Interactions

There may be interactions between ECN with other congestion control mechanisms or priority handling schemes in use by endpoints / networks.

[ITU-T H.248.81] clause 9 and Appendix II provide some details on the interaction between ECN and the Emergency Telecommunications Service (ETS) [ITU-T E.107].

## Annex C (informative): Change history

| Change history |       |           |           |      |   |        |        |  |
|----------------|-------|-----------|-----------|------|---|--------|--------|--|
| Date           | TSG # | TSG Doc.  | CR        | Rev  | Subject/Comment   | Old    | New    |  |
| 2009-12        | CT#46 | CP-090821 |           |      | 3GPP TS Presented for approval in CT#46                                     | 2.0.0  | 9.0.0  |  |
| 2010-03        | CT#47 | CP-100043 | 0006      | 1    | Another Reference Tidy-Up   | 9.0.0  | 9.1.0  |  |
|                |       |           | 0007      | 1    | ServiceChange Correction  |        |        |  |
|                |       |           | 0008      | 1    | Termination Type Alignment  |        |        |  |
|                |       |           | 0009      | 1    | Error Code Additions  |        |        |  |
|                |       |           | 0010      |      | Returned SDP Properties   |        |        |  |
|                |       |           | 0011      | 1    | Package Usage   |        |        |  |
|                |       |           | 0012      | 2    | Call Related Procedures   |        |        |  |
|                |       |           | 0013      | 1    | Non-Call Related Procedures   |        |        |  |
|                |       |           | 0014      | 1    | Clean-up Proposals  |        |        |  |
|                |       |           | 0015      |      | Resolution of Editor's Notes  |        |        |  |
| 2010-06        | CT#48 | CP-100289 | 0016      | 1    | Transport protocol to be indicated to gateway for end-to-end media security | 9.1.0  | 9.2.0  |  |
|                |       |           | CP-100283 | 0017 | 1   |        |        | Handling of Stream mode  |
|                |       |           | CP-100283 | 0018 | 1   |        |        | Package Updates  |
|                |       |           | CP-100283 | 0019 | 1   |        |        | Descriptor Updates   |
| 2010-09        | CT#49 | CP-100460 | 0020      |      | Procedures for Emergency indicator  | 9.2.0  | 9.3.0  |  |
|                |       |           | 0021      |      | Priority indicator  |        |        |  |
| 2011-03        | CT#51 | CP-110274 | 0022      | 10   | ECN Support in Ix Interface   | 9.3.0  | 10.0.0 |  |
|                |       |           | CP-110058 | 0023 | 1   |        |        | Handling of rtcp-fb SDP attribute and SDP attribute for RTCP APP feedback messages |
| 2011-06        | CT#52 | CP-110368 | 0024      |      | ECN Failure improvements  | 10.0.0 | 10.1.0 |  |
|                |       |           | 0026      | 1    | Interworking with Non-3GPP ECN networks                                     |        |        |  |
|                |       |           | 0027      | 1    | Alignment of 3GPP profiles with SG16 ECN package definition                 |        |        |  |
| 2011-09        | CT#53 | CP-110564 | 0028      | 1    | Incorporation of latest ITU-T ECN package and proposed ammendment           | 10.1.0 | 10.2.0 |  |
| 2011-12        | CT#54 | CP-110798 | 0029      | 1    | Adding of stage 3 for ATCF/ATGW function                                    | 10.2.0 | 10.3.0 |  |
|                |       |           | CP-110796 | 0030 |   |        |        | Update of reference to H.248.52  |
|                |       |           | CP-110789 | 0031 | 1   |        |        | ECN Improvements   |
|                |       |           | CP-110789 | 0032 |   |        |        | Missing "rtcp-xr" SDP attribute in Table about Optional SDP Information Elements   |
| 2012-06        | CT#56 | CP-120226 | 0033      | 1    | Reference update: draft-ietf-avtcore-ecn-for-rtp                            | 10.3.0 | 10.4.0 |  |
| 2012-09        | CT#57 | CP-120478 | 0034      | 3    | Support of Multimedia Priority Service (MPS) over Ix Interface – Stage 3    | 10.4.0 | 11.0.0 |  |
| 2012-12        | CT#58 | CP-120723 | 0040      | 1    | Ix interface updates of ECN Support Package                                 | 11.0.0 | 11.1.0 |  |
|                |       |           | CP-120734 | 0041 | 3   |        |        | Support of Multimedia Priority Service (MPS) in Modify over Ix Interface – Stage 3 |

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# History

| <b>Document history</b> |              |             |
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| V11.1.0                 | January 2013 | Publication |
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|                         |              |             |