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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 10.5.0 Release 10)

Reference

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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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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.
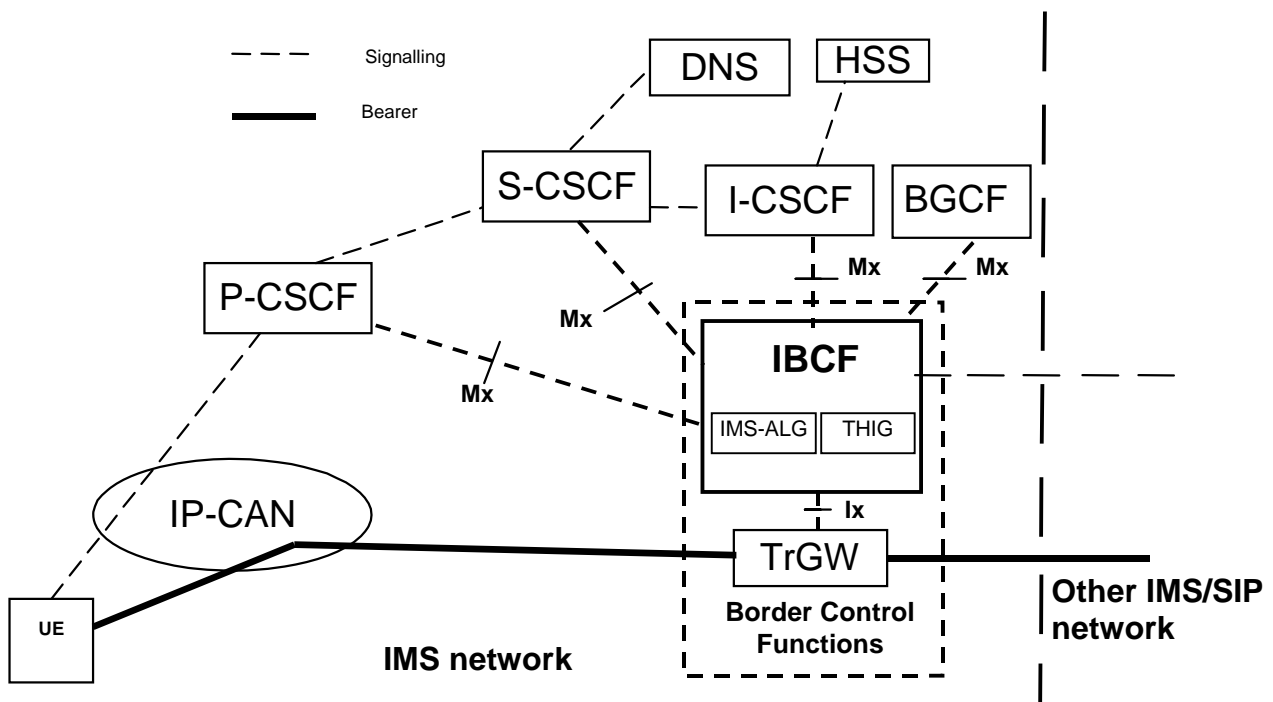
Figure 1.1: Reference model for IMS Border Control Functions
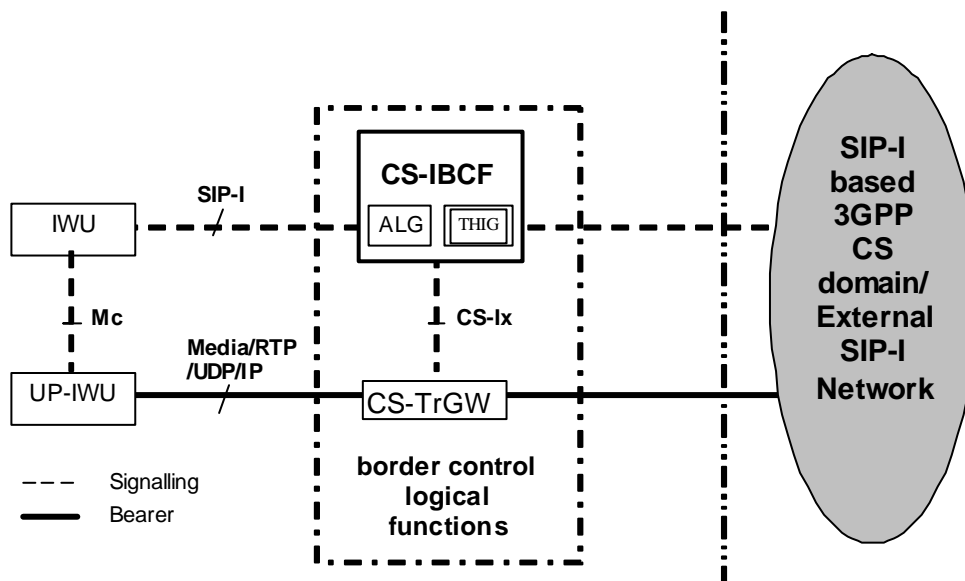
Figure 1.2: Reference model for CS Border Control Functions

The reference model for the IBCF and the TrGW supporting the ATCF/ATGW function is shown in Figure 1.x below.
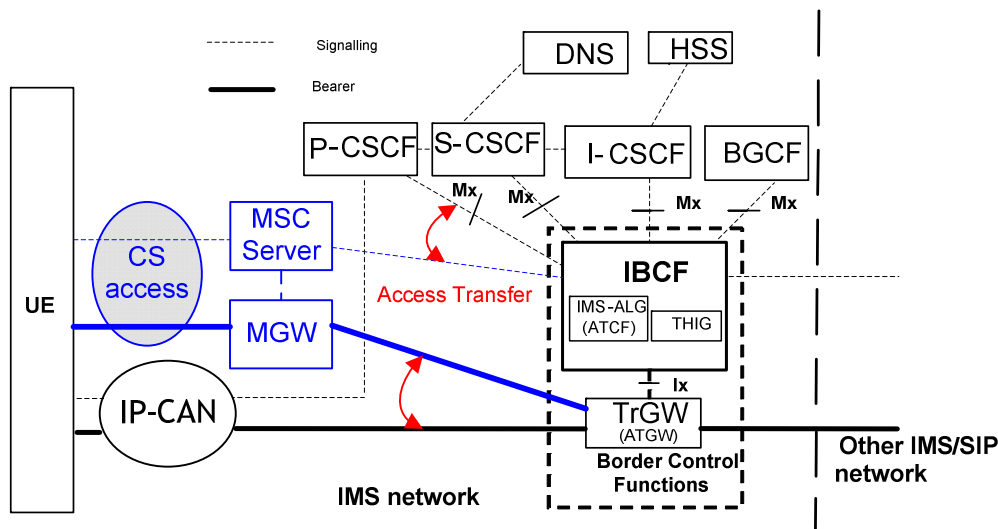
Figure 1.3: Reference model for IBCF/TrGW with ATCF/ATGW function

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".

[14]   ITU-T Recommendation H.248.41 Amendment 1 (06/2008): "Gateway control protocol: IP domain connection package: IP Realm Availability Package".

[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".

[33]   IETF RFC 3711 (2004): "The Secure Real-time Transport Protocol (SRTP)".

[34]   IETF RFC 5124 (2008): "Extended Secure RTP Profile for Real-time Transport Control Protocol (RTCP)-Based Feedback (RTP/SAVPF)".

[35]   IETF RFC 6679 (2012): "Explicit Congestion Notification (ECN) for RTP over UDP".

[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".

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 μ-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
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

Profile name:	threeglx
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.

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

Maximum number of contexts:	Provisioned
Maximum number of terminations per context:	3
Allowed termination type combinations in a context:	(IP,IP) ; (IP,IP,IP) (NOTE)
NOTE: 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
Topology	Yes (NOTE 1)	See clause 5.7.9
Priority Indicator	NO(NOTE 2)	0-15
Emergency Indicator	Yes	YES/NO
IEPS Indicator	No	NA
ContextAttribute Descriptor	No	NA
ContextIdList Parameter	No	NA
AND/OR Context Attribute	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.		

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

Multiplex Terminations Supported?	No

If yes then:

Table 5.6.2.2: Multiplex Types

Multiplex Types Supported	None
Maximum Number of Terminations Connected to Multiplex	-

5.7 Descriptors

5.7.1 TerminationState Descriptor

Table 5.7.1.1: ServiceState property

ServiceState property used:	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

EventBufferControl property used:	No

5.7.2 Stream Descriptor

5.7.2.0 General

Table 5.7.2.1: Stream descriptor

Maximum number of streams per termination type:	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

Stream Configuration:	ALL configurations are allowed

5.7.2.1 LocalControl Descriptor

Table 5.7.2.1.1: Reserve Group and Reserve Value

		Termination Type	Stream Type
Reserve group used:	No	NA	NA
Reserve value used:	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		
If yes	**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 (ecnrous/fail, 0x010b/0x0001) see Annex B	IP	RTP Based

Table 5.7.3.2: Event Buffer Control

Event Buffer Control used:	No

Table 5.7.3.3: Keep Active

Keepactive used on events:	No

Table 5.7.3.4: Embedding in event

Embedded events in an event descriptor:	No
Embedded signals in an event descriptor:	No

Table 5.7.3.5: Regulated Embedded Events

Regulated Embedded events are triggered on:	None

Table 5.7.3.6: Reset Events Descriptor Flag

ResetEventsDescriptor used with events:	None

Table 5.7.3.7: Notification Behaviour

NotifyImmediate:	ALL Events
NotifyRegulated:	None
NeverNotify:	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

Event Buffer descriptor used:	No	
If yes	**EventIDs**	

5.7.5   Signals descriptor

Table 5.7.5.1: Signals dependant on termination or streams

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

Table 5.7.5.2: Signal Lists

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

Table 5.7.5.3: Overriding Signal type and duration

Signal type and duration supported:	No	
If yes	**Signal ID**	**Type or duration override**
	-	-

Table 5.7.5.4: Signal Direction

Signal Direction supported:	No

Table 5.7.5.5: Notify completion

NotifyCompletion supported:	No	
If yes	Signal ID	Type of completion supported
	-	-

Table 5.7.5.6: RequestID Parameter

RequestID Parameter Supported:	No

Table 5.7.5.7: Signals played simultaneously

Signals played simultaneously:	No	
If yes	SignalIDs that can be played simultaneously:	-

Table 5.7.5.8: Keep Active

KeepActive used on signals:	No

5.7.6 DigitMap descriptor

Table 5.7.6.1: DigitMap Descriptor

DigitMaps supported:	No		
If yes	DigitMap Name	Structure	Timers
	-	-	-

5.7.7 Statistics descriptor

Table 5.7.7.1: Statistics Descriptor

Statistics supported on:	-

Table 5.7.7.2: Statistics reported on Subtract

Statistics reported on Subtract:	No		
If yes	Statistic IDs Reported	Termination Type	Stream Type
	-	-	-

5.7.8 ObservedEvents descriptor

Table 5.7.8.1: ObservedEvents Descriptor

Event detection time supported:	No

5.7.9 Topology descriptor

Table 5.7.9.1: Topology descriptor

Allowed triples:	(T1, T2, isolate)
	(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

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

ETSI

Table 5.7.10.2: Error codes sent by the TrGW

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

Descriptors used by Add request:	Media (Stream(LocalControl, Local, Remote)), Event, Signals

Table 5.8.1.2: Descriptors used by Add reply

Descriptors used by Add reply:	Media (Stream (Local)), Error
	
	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:
	  - The Error Descriptor
	  - 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

5.8.2 Modify

Table 5.8.2.1: Descriptors used by Modify request

Descriptors used by Modify request:	Media (TerminationState, Stream (LocalControl, Local, Remote)), Signals, Event

Table 5.8.2.2: Descriptors used by Modify reply

Descriptors used by Modify reply:	Media (Stream(Local)), Error
	
	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:
	  - The Error Descriptor
	  - SDP properties returned in "Configure TrGW Connection Point" procedure as specified in 15.17.2.3.

5.8.3   Subtract

Table 5.8.3.1: Descriptors used in Subtract request

Descriptors used by Subtract request:	None or Audit() NOTE
NOTE: this is to explicitly avoid reporting any statistics.	

Table 5.8.3.2: Descriptors used in Subtract reply

Descriptors used by Subtract reply:	None, Error

5.8.4   Move

Table 5.8.4.1: Command Move

Move command used:	No

Table 5.8.4.2: Descriptor used by Move command

Descriptors used by Move Request:	-
Descriptors used by Move Reply:	-

5.8.5   AuditValue

Table 5.8.5.1: Descriptors used by AuditValue

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

5.8.6   AuditCapabilities

Table 5.8.6.1: AuditCapabilities

Audited Properties:	Property Name and Identity	Descriptor
	None	-
Audited Statistics:	None	
Audited Signals:	None	
Audited Events:	None	

Table 5.8.6.2: Scoped Auditing

Audited Properties / ContextAttributes used for a scoped audit :	None

5.8.7 Notify

Table 5.8.7.1: Descriptors used by Notify

Descriptors used by Notify Request:	ObservedEvents
Descriptors used by Notify Reply:	None, Error

5.8.8 ServiceChange

Table 5.8.8.1: ServiceChangeMethods and ServiceChangeReasons sent by IBCF

ServiceChangeMethods Supported:	ServiceChangeReasons supported:
Handoff (NOTE 2, NOTE 3)	"903 MGC Directed Change" (Optional, NOTE 4)
Restart (NOTE 2)	"901 Cold Boot" (Optional) "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 MGCId 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 ServiceChangeMgcId 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

Service Change Methods Supported:	ServiceChange Reasons supported:
Forced	"904 Termination Malfunction", ALL except ROOT (Optional, NOTE 4) "905 Termination Taken Out Of Service" , ALL(Mandatory) "906 Loss Of Lower Layer Connectivity" , ALL except ROOT (Optional, NOTE 4) "907 Transmission Failure" , ALL except ROOT (Optional, NOTE 4) "908 MG Impending Failure" ROOT only (Mandatory) "910 Media Capability Failure" , ALL except ROOT (Optional, NOTE 4 "915 State Loss" ROOT only (Optional, NOTE 4)
Graceful	"905 Termination Taken Out Of Service" , (Optional, NOTE 4) "908 MG Impending Failure" (Optional, NOTE 4)
Disconnected (NOTE 1)	"900 Service Restored" (Mandatory) "916 Packages Change" (Optional) "917 Capability Change" (Optional)
Restart (NOTE 1)	"900 Service Restored" (Mandatory) "901 Cold Boot" (Mandatory) "902 Warm Boot" (Mandatory) "916 Packages Change" (Optional) "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. NOTE 2: ROOT Only. NOTE 3: In response to an IBCF Ordered Re-Register. NOTE 4: Support of this procedure is mandatory in the IBCF.	

Table 5.8.8.3: Service Change Address

ServiceChangeAddress used:	No

Table 5.8.8.4: Service Change Delay

ServiceChangeDelay used:	No	
If yes	**Valid time period:**	-

Table 5.8.8.5: Service Change Incomplete Flag

ServiceChange Incomplete Flag used:	No

Table 5.8.8.6: Service Change Version

Version used in ServiceChangeVersion:	2 or 3
NOTE: Version 2 shall be supported as the minimum protocol version. See subclause 5.3.	

Table 5.8.8.7: ServiceChangeProfile

ServiceChangeProfile mandatory:	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

Profile negotiation as per H.248.18:	No

Table 5.8.8.9: ServiceChangeMGCId

ServiceChangeMGCId used:	Yes

5.8.9 Manipulating and auditing context attributes

Table 5.8.9.1: Manipulating and Auditing Context Attributes

Context Attributes Manipulated:	Emergency
Context Attributes Audited:	None

5.9 Generic command syntax and encoding

Table 5.9.1: Command Encoding

Supported Encodings:	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

Maximum number of Transaction Requests / Replies / TransResponseAcks / Segment Replies per message:	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

Maximum number of commands per Transaction request:	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

Maximum number of commands per Transaction reply:	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

Commands able to be marked "Optional":	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

Wildcarded responses may be requested for:	Subtract

Table 5.10.6: Procedures for Wildcarded Responses

Procedures that make use of wildcarded responses:	Release TrGW Termination

Table 5.10.7: Transaction Timers

Transaction Timer:	Value
NormalMGExecutionTime	Provisioned
NormalMGCExecutionTime	Provisioned
MGOriginatedPendingLimit	Provisioned
MGCOriginatedPendingLimit	Provisioned
MGProvisionalResponseTimerValue	Provisioned
MGCProvisionalResponseTimerValue	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

Supported Transports:	1. IPv4-based network control plane:
	    • SCTP/IPv4 (Recommended) NOTE1
	    • UDP/IPv4 (Optional)
	2. IPv6-based network control plane:
	    • SCTP/IPv6 (Recommended) NOTE1
	    • UDP/IPv6 (Optional)

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

Segmentation Supported:	SCTP: Inherent in Transport UDP: No

Table 5.12.3: Control Association

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

5.13 Security

Table 5.13.1: Security

Supported Security:	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

Mandatory Packages		
Package Name	Package ID	Version
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, (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. 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])	threegint (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	-	-	-	-
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**		
Cause (g/cause, 0x0001/0x0001)	M	ADD, MOD, NOTIFY		
	Event Parameters	**Mandatory/Optional**	**Supported Values**	**Provisioned Value**
	None	-	-	-
	ObservedEvent Parameters	**Mandatory/Optional**	**Supported Values**	**Provisioned Value**
	General cause (Generalcause, 0x0001)	M	"NR" (0x0001) Normal Release "UR" (0x0002) Unavailable Resources "FT" (0x0003) Failure, Temporary "FP" (0x0004) Failure, Permanent "IW" (0x0005) Interworking Error "UN" (0x0006) Unsupported	Not Applicable
	Failure cause (Failurecause, 0x0002)	O	Octet String	Not Applicable
Events	**Mandatory/Optional**	**Used in command**		
Signal Completion. (g/sc, 0x0001/0x0002)	Not Used	-		
	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	-			

5.14.3.2   Base root (root)

Table 5.14.3.2.1: Base root package

Properties	Mandatory/Optional	Used in command	Supported Values	Provisioned Value
MaxNrOfContexts (root/maxNumberOfContexts, 0x0002/0x0001)	O	AUDITVALUE	ALL	YES
MaxTerminationsPerContext (root/maxTerminationPerContext, 0x0002/0x0002)	O	AUDITVALUE	ALL	YES
normalMGExecutionTime (root/normalMGExecutionTime, 0x0002/0x0003)	O	AUDITVALUE	ALL	YES
normalMGCExecutionTime (root/normalMGCExecutionTime, 0x0002/0x0004)	O	AUDITVALUE	ALL	YES
MGProvisionalResponseTimer Value (root/MGProvisionalResponse TimerValue, 0x0002/0x0005)	O	AUDITVALUE	ALL	YES
MGCProvisionalResponseTim erValue (root/MGCProvisionalRespons eTimerValue, 0x0002/0x0006)	O	AUDITVALUE	ALL	YES
MGCOriginatedPendingLimit (root/MGCOriginatedPendingLi mit, 0x0002/0x0007)	O	AUDITVALUE	ALL	YES
MGOriginatedPendingLimit (root/MGOriginatedPendingLi mit, 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 (gm/saf,0x008c/0x0001)	M	ADD, MODIFY	ALL	Not Applicable
Remote Source Address Mask (gm/sam,0x008c/0x0002)	O	ADD, MODIFY	ALL	Not Applicable
Remote Source Port Filtering (gm/spf,0x008c/0x0003)	M	ADD, MODIFY	ALL	Not Applicable
Remote Source Port (gm/spr,0x008c/0x0004)	O	ADD, MODIFY	ALL	Not Applicable
Explicit Source Address Setting (gm/esas,0x008c/0x0005)	Not Supported	NONE	-	-
Local Source Address (gm/lsa,0x008c/0x0006)	Not Supported	NONE	-	-
Explicit Source Port Setting (gm/esps,0x008c/0x0007)	Not Supported	NONE	-	-
Local Source Port (gm/lsp,0x008c/0x0008)	Not Supported	NONE	-	-
Remote Source Port Range (gm/sprr,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 (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 (*rsb*).				

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 *ipdc/realm* 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 *ipdc/realm* 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 (ocp/mg_overload, 0x0051/0x0001) (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 **either** only following the **first ADD.request** which creates a new Context, **or** following **all ADD.request** commands (see ITU-T Recommendation H.248.11 [16] Corrigendum 1). 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 (hangterm/thb, 0x0098/0x0001)	M	ADD, MODIFY, NOTIFY		
	Event Parameters	**Mandatory/Optional**	**Supported Values**	**Provisioned Value**
	Timer X (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 TISPAN Ia version 3 profile [4].				
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 (chp/mgcon, 0x0029/0x0001)	M	MODIFY, NOTIFY		
	Event Parameters	**Mandatory/Optional**	**Supported Values**	**Provisioned Value**
	None	-	-	-
	ObservedEvent Parameters	**Mandatory/Optional**	**Supported Values**	**Provisioned Value**
	Reduction (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, (ipra/ar, 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 Changed, (ipra/arc, 0x00e0/0x001)	M	MODIFY, NOTIFY		
	Event Parameters	**Mandatory/Optional**	**Supported Values:**	**Provisioned Value**
	-	-	-	-
	ObservedEvent Parameters	**Mandatory/Optional**	**Supported Values**	**Provisioned Value**
	Newly Available Realms (nar, 0x0001)	M	ALL	Not applicable
	Newly Unavailable Realms (nur, 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 (threegint /ipint, (0x00e3/0x0001)	M	ADD, MOD	"NboIP" (0x0001) "MboIP" (0x0003) "ExtSIPI" (0x0004)	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**		
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	-			

5.14.3.13   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 (rtcph/rsb,0x00b5/0x0009)	M	ADD, MODIFY	ALL	OFF
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	-			

5.14.3.14 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) "RDCC"(0x0002) NOTE1	"RDCC"(0x0002)
Initiation Method (ecnrous/initmethod, 0x010b/0x0003)	M	ADD, MODIFY	"rtp" (NOTE 2) "leap", "inactive"	"leap"
ECN Mode (ecnrous/mode, 0x010b/0x0004)	O	ADD, MODIFY	"setonly" (0x0001) (NOTE 2) "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) "0" (0x0002) "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)

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		
ECN Failure (ecnrous/fail, 0x010b/0x0001)	M	ADD, MODIFY, NOTIFY		
	Event Parameters	Mandatory/Optional	Supported Values	Provisioned Value
	-	-	-	-
	-	-	-	-
	ObservedEvent Parameters	Mandatory/Optional	Supported Values	Provisioned Value
	Failure Type (type,0x0001)	Mandatory	INIT, USE	-
	Media Sender SSRC (ssrc, 0x0002)	Not Supported	-	-

Statistics	Mandatory/Optional	Used in command	Supported Values
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 (ecnrous/dup, 0x010b/0x0008)	Not Supported	-	-
Error Codes	**Mandatory/Optional**		
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 "	<nettype> <addrtype> and <connection address> 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 <connection address> subfield.
m-line	"SDP_M "	There are four fields (or SDP values) <media>, <port>, <proto> and <fmt> in the "m=" line (see IETF RFC 4566 [8]; NOTE 1). The "m=" line may be omitted from SDP. <media>, <port>, <proto > and <fmt-list> are required if the "m=" line is included. Media type <media> : The <media> field shall be set to "audio" or "video" or "message" or "-", When "-" is used for the *media* 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. Transport port <port> The *port* value may be underspecified with CHOOSE wildcard. Transport protocol <proto> As in table 5.15.2. Media format <fmt> Various values may be used for media-format, dependent on the related <media>. "-" may be used for the *format list* value if no media reservation is required at this stage. If the MG does not support the requested media format value the MG shall reject the command with error code 449.
b-line	"SDP_B "	Shall not be used without an "m=" line. The *modifier* values shall be "AS", "RS" and "RR". The "AS" *modifier* implies that the *bandwidth-value* represents the "maximum bandwidth" (see clause 5.8/IETF RFC 4566 [8]). The *bandwidth-value* relates therefore to the *peak bitrate* (NOTE 2). The *bandwidth-value* value defines the IP layer bandwidth for the specific H.248 Stream. 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 *bandwidth* 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].

o-line	"SDP_O"	The origin line consists of six fields: (<username>, <sess-id>, <sess-version>, <nettype>, <addrtype> and <unicast-address>). 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]). 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: - <user name> should contain an hyphen - <session ID> and <version> should contain one or mode digits as described in IETF RFC 4566 [8] - <network type> shall be set to IN - <address type> 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. - <address> should contain the fully qualified domain name or IP address of the gateway.
s-line	"SDP_S"	The session name "s=" line contains a single field s= <session name>. 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]). 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: - "s=-"
t-line	"SDP_T"	The time "t=" line consists of two fields t= <start time> and <stop time>. 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]). 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: "t=0 0"
NOTE 1: IETF RFC 4566 [8] enables "-" as a valid character (i.e. for both IMS-Ix and CS-Ix). NOTE 2: The unit for the *bandwidth-value* (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 *bandwidth-value* is thus independent of the traffic characteristic and relates to the peak bitrate for CBR and VBR traffic.		

Table 5.15.2: Transport Protocol

Transport Protocol <proto> in m-line:	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 Udptl 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 rtcph/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 rtcph/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 "	1) Application "RTCP transport address control": The attribute "a=rtcp" line may either contain (a=rtcp: <port>) or (a=rtcp: <port> <network type> <address type> <connection address>) when the "a=" line is used for RTCP transport port and optionally network address transmission, see IETF RFC 3605 [7]. 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. "RTCP transport address control" should be supported by MG. 2) Application " Media interworking (transcoding)": 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). 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)
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 *Available Realms* property in ITU-T Recommendation H.248.41 [14].
BNC Release	Events, ObservedEvents Descriptor	As for the Events/ObservedEvents Descriptor in subclause E.1.2.1/ITU-T Recommendation H.248.1 [3] "Cause"
Cause	ObservedEvents 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 *Available Realms Changed* event in ITU-T Recommendation H.248.41 [14].
Codec List	Local Descriptor or Remote Descriptor	<fmt list> in a single SDP m-line. 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). 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. Binary Encoding: Encoding as per ITU-T Recommendation H.248.1 Annex A [3] "streamMode" 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. 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 *Differentiated Services Code Point* property in ITU-T Recommendation H.248.52 [12].
Diffserv Tagging Behaviour	Local Control	Defined according to the *Tagging Behaviour* property in ITU-T Recommendation H.248.52 [12].
ECN Congestion Response	Local descriptor or 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 Remote Descriptor	Defined according to "ECT Marking" property in ITU-T Recommendation H.248.82, see Annex B NOTE
ECN Enabled	Local Descriptor or Remote Descriptor	Defined according to the "ECN Enabled" property in ITU-T Recommendation H.248.82, see Annex B.
ECN Failure	Events, Observed Events	Defined according to the "ECN Failure" Event in ITU-T Recommendation H.248.82, see Annex B.
ECN Failure Type	ObservedEvents Descriptor	As for the ObservedEventsDescriptor Parameter "Failure Type" in Annex B
ECN Initiation Method	Local Descriptor or Remote Descriptor	Defined according to "Initiation Method" property in ITU-T Recommendation H.248.82, see Annex B.
ECN Mode	Local Descriptor or Remote Descriptor	Defined according to the "ECN Mode" property in ITU-T Recommendation H.248.82, see Annex B. NOTE
ECN RTCP Feedback	Local Descriptor or Remote Descriptor	"rcfp-fb" SDP attribute with the "nack" feedback parameter as derfined in IETF RFC 4585 and the "ecn" parameter value according to IETF RFC 6679 [35]
ECN XR Summary Report	Local Descriptor or 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 Binary Encoding: Encoding as per ITU-T Recommendation H.248.1 [3] Annex A "Emergency" context attribute Textual Encoding: Encoding as per ITU-T Recommendation H.248.1 [3] Annex B "EmergencyToken" context attribute
Inactivity Timeout	Events, Observed Events	Defined according to *Inactivity Timeout* event in ITU-T Recommendation H.248.14 [19].
IP Address	Local Descriptor or 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 *IP Realm Identifier* 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.
Realm Availability Change	Events, Observed Events	According to *Available Realms Changed* 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 *Remote Source Address Filtering* property in ITU-T Recommendation H.248.43 [6].
Remote Source Address Mask	Local Control	Defined according to *Remote Source Address Mask* property in ITU-T Recommendation H.248.43 [6].
Remote Source Port Filtering	Local Control	Defined according to *Remote Source Port Filtering* property in ITU-T Recommendation H.248.43 [6].
Remote Source Port	Local Control	Defined according to *Remote Source Port* property in ITU-T Recommendation H.248.43 [6].
Remote Source Port Range	Local Control	Defined according to *Remote Source Port Range* property in ITU-T Recommendation H.248.43 [6].
Reserve_Value	Local Control	ITU-T Recommendation H.248.1 [3] Reserve property. Binary Encoding: Encoding as per ITU-T Recommendation H.248.1[3] Annex A "reserveValue" 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 *RTCP Allocation Specific Behaviour* 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". 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 *Termination Heartbeat* 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. 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. 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 15.17.2.1.1

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

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

	Policing Required
	Peak Data Rate
	If Delay Variation required
	   Delay Variation Tolerance
	
	If RTCP handling required:
	  RTCP allocation
	
	If ECN transparent support required:
	ECN Enable = "True"
	  Initiation Method = "inactive"
	
	If ECN Endpoint support required
	  ECN Enable = "True"
	  Initiation Method = "ECN Initiation
	Method" NOTE 2
	
	  Congestion Response = "ECN
	    Congestion Response"
	       NOTE 3
	  ECN Mode = "ECN mode"
	       NOTE 3
	  ECT Marking = "ECN ECT
	    marking" NOTE 3
	
	  RTCP Feedback = "ECN RTCP
	    Feedback" NOTE 3
	
	  XR Summary Report = "ECN XR
	    Summary Report" NOTE 3
	If notification of ECN Failure
	  Report:
	    NotificationRequested (Event
	ID
	= x," ECN Failure")	

NOTE 1: The event parameters "Media Inactivity Detection Time" and "Media Inactivity Detection Direction" are optional. NOTE 2: This shall be set to a value other than "inactive" 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].		

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 {
  Port
  IP Address
  IP Version
}
	Transaction ID = x
	Context ID = C1
	Termination ID = T1
	Stream Number
		Local Descriptor {
		If media is "audio" or "video":
		
		  Codec List
		  RTP Payloads
		  Rtpbw
		  If RTCP bandwidth
		    RtcpbwRS
		    RtcpbwRR
		
		}

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

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

ETSI

	ECN Enable = "True" Initiation Method = "ECN Initiation Method" NOTE 3 Congestion Response = "ECN Congestion Response" NOTE 4 ECN Mode = "ECN mode" NOTE 4 ECT Marking = "ECN ECT marking" NOTE 4 RTCP Feedback = "ECN RTCP Feedback" NOTE 4 XR Summary Report = "ECN XR Summary Report" NOTE 4 If notification of ECN Failure Report: NotificationRequested (Event ID = x," ECN Failure")	
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.		
NOTE 2: The event parameters "Media Inactivity Detection Time" and "Media Inactivity Detection Direction" are optional.		
NOTE 3: This shall be set to a value other than "inactive".		
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].		

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:
  Local Descriptor {
    Port
    IP Address
    IP Version
  }
If remote resources are provided in request:
  Remote Descriptor {
    Port
    IP Address
    IP Version
  } NOTE
	Transaction ID = x
	Context ID = C1
	Termination ID = T1
	
	If Stream Number Specified:
	  Stream Number
		If local resources were provided in request:
		  Local Descriptor {
		  If media is "audio" or "video":
		    Codec List
		    RTP Payloads
		    Rtpbw
		    If RTCP bandwidth
		      RtcpbwRS
		      RtcpbwRR
		
		  }
		If remote resources are provided in request:
		  Remote Descriptor {
		  If media is "audio" or "video":
		    Codec List
		    RTP Payloads
		    Rtpbw
		    If RTCP bandwidth
		      RtcpbwRS
		      RtcpbwRR
		
		  } 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

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

| | If peak data rate policing
   Policing Required
   Peak Data Rate
   If Delay Variation required
      Delay Variation Tolerance

If RTCP handling required:
  RTCP allocation

If ECN transparent support required:
ECN Enable = "True"
  Initiation Method = "inactive"

If ECN Endpoint support required
  ECN Enable = "True"
  Initiation Method = "ECN Initiation
Method" NOTE 2

   Congestion Response = "ECN
     Congestion Response"
        NOTE 3
    ECN Mode = "ECN mode"
        NOTE 3
  ECT Marking = "ECN ECT
    marking" NOTE 3

  RTCP Feedback = "ECN RTCP
    Feedback" NOTE 3

  XR Summary Report = "ECN XR
    Summary Report" NOTE 3

If notification of ECN Failure
  Report:
   NotificationRequested (Event
ID
= x," ECN Failure") | |
| NOTE 1: The event parameters "Media Inactivity Detection Time" and "Media Inactivity Detection Direction" are optional.
NOTE 2: This shall be set to a value other than "inactive"
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]. | | |

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 {
   Port
   IP Address
   IP Version
 }
Remote Descriptor {
   Port
   IP Address
   IP Version
 } NOTE
	Transaction ID = x
	Context ID = C1
	Termination ID = T1
	Stream Number
		Local Descriptor {
		If media is "audio" or "video":
		   Codec List
		   RTP Payloads
		   Rtpbw
		   If RTCP bandwidth
		     RtcpbwRS
		     RtcpbwRR
		
		 }
		Remote Descriptor {
		If media is "audio" or "video":
		  Codec List
		  RTP Payloads
		  Rtpbw
		  If RTCP bandwidth
		   RtcpbwRS
		   RtcpbwRR
		
		 } 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 Context ID= C1/ALL 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 Context ID = C1/ALL 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 Context ID = C1 Termination ID = T1 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 Context ID = C1 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 Context ID = C1 Termination ID = T1 Event_ID (Event ID = x, "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 Context ID = C1 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 Context ID = C1 Termination ID = T1 Event_ID (Event ID = x, "Media 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 Context ID = C1 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
	If Context Requested:
	   Context ID = $
	If Context Provided:
	   Context ID = c1
	
	If Termination Requested:
	   Termination ID = $
	If Termination Provided:
	   Termination ID = T1
	
	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 Context ID = C1 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 Context ID= C1 Termination ID = T1 Event_ID (Event ID = x, " 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 Context ID = C1 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
	If Context Requested:
	  Context ID = $
	If Context Provided:
	  Context ID = c1
	
	If Termination Requested:
	  Termination ID = $
	If Termination Provided:
	  Termination ID = T1
	
	Connection Configuration =
	   (TerminationID= x1,
	   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 Context ID = C1 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 (NOTE 3	5.17.3.6
IBCF Ordered Re-register	Optional (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 (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 (NOTE 4)	5.17.3.15
Inactivity timeout indication	Optional (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 (NOTE 1)	5.17.3.19 (NOTE 2)
NOTE 1: Support of this procedure is mandatory in the IBCF. NOTE 2: The "Termination Out-of-Service procedure" is also used as a call-related H.248 command NOTE 3: Support of this procedure is mandatory in the TrGW. 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 Context ID= - Termination ID = ROOT SC Method = FORCED or GRACEFUL 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 Context ID = - 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 Context ID= - Termination ID = ROOT SC Method = DISCONNECTED 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 Context ID = - Termination ID = ROOT If required to register to new IBCF: 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 Context ID= - Termination ID = ROOT SC Method = RESTART 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 Context ID = - Termination ID = ROOT If required to register to new IBCF : 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 Context ID= - Termination ID = ROOT SC Method = RESTART SC Reason =901, Cold Boot or 902, Warm Boot H248 Profile Identity 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
	Context ID = -
	Termination ID = ROOT
	If applicable (NOTE): H248 Protocol Version
	If applicable:-
	  H248 Profile Identity
	If required to register to new IBCF :
	  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 Context ID= - Termination ID = ROOT SC Method = Handoff SC Reason = 903, MGC Directed Change H248 Profile Identity 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
	Context ID = -
	Termination ID = ROOT
	If applicable (NOTE 1):
	  H248 Protocol Version
	If applicable:-
	  H248 Profile Identity
	If required to register to a new IBCF:
	  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 Context ID= - Termination ID = ROOT SC Method = HANDOFF SC Reason = 903, MGC Directed Change 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 Context ID = - 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 Context ID= - Termination ID = ROOT SC Method = RESTART SC Reason = 901, Cold Boot OR 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 Context ID = - 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 Context ID= - Termination ID = ROOT SC Method = FORCED or GRACEFUL SC Reason = 905, Termination 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 Context ID = - 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 Context ID= -/ALL/C1 Termination ID = ROOT/ALL/T1/PartialWildcard (NOTE 4, NOTE5) Audit Packages (NOTE 1) Audit Descriptor = IndAuditParameter:= IndAudMediaDescriptor:= IndAudTerminationStateDescriptor:= serviceState Audit Descriptor = Empty (NOTE 2) Audit Descriptor = IndAuditParameter:= IndAudMediaDescriptor:= IndAudTerminationStateDescriptor:= Available Realms (NOTE 3) Audit Descriptor = IndAuditParameter:= IndAudMediaDescriptor:= IndAudTerminationStateDescriptor:= ROOT properties (NOTE 6)	
NOTE 1: Packages is for Null/Root Combination. NOTE 2: Used for control association monitoring. NOTE 3: Used for auditing available IP realms 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/*"). NOTE 5: Partial wildcard shall only be used when text encoding is used on the H.248 interface. 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 Context ID = -/C1 Termination ID = ROOT/T1 Packages List serviceState Available Realms 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 Context ID = c1 or no context Termination ID = T1 or no termination ID 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 Context ID= - Termination ID = ROOT SC Method = RESTART SC Reason = 917, Capability Change H248 Profile Identity 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 Context ID = - 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 Context ID= - Termination ID = ROOT NotificationRequested (Event ID = x, "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 Context ID = - 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
	Context ID= -
	Termination ID = ROOT
	
	If H.248.11 used:
	    Event_ID (Event ID = x,
	    "Overload Notification")
	
	If H.248.10 used:
	    Event_ID (Event ID = x, "
	    Overload Notification
	    (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 Context ID = - 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 Context ID= NULL Termination ID = ROOT 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 Context ID = NULL 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 Context ID= NULL Termination ID = ROOT 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 Context ID = NULL 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 Context ID= - Termination ID = ROOT 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 Context ID = - 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 Context ID= - Termination ID = ROOT Event_ID (Event ID = x, "Realm Availability Change (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 Context ID = - 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 Context ID= C1/ALL Termination ID = T1 or Wildcarded Termination (NOTE) SC Method = FORCED SC Reason = 904 ("Termination Malfunction") or 905 ("Termination Taken OOS") or 906 ("Loss of Lower Layer Connectivity"), or 907 ("Transmission Failure") or 910 ("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 Context ID = C1/ALL 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).
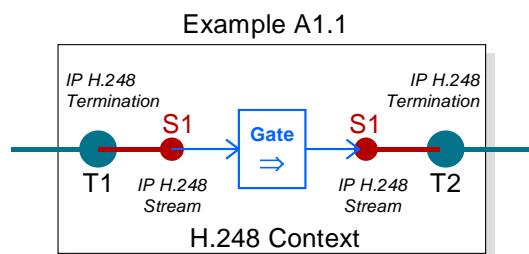

Figure A.2.1: H.248 Context - Illustration of Gate, Stream and Terminations

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.
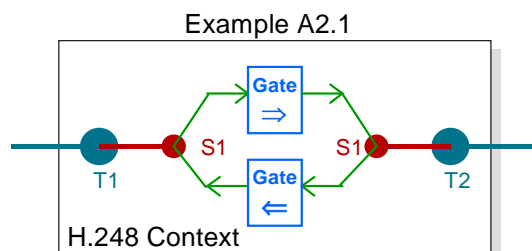

Figure A.2.2: H.248 Context Bidirectional Session using single H.248 Streams

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]

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), Emergency Telecommunications Service (ETS) and interconnection framework for national implementations of ETS.
[ITU-T H.248.1]	Recommendation ITU-T H.248.1 (09/05) + Amendment 1 (05/08) + Amendment 2 (12/09), *Gateway Control Protocol: Version 3*.
[ITU-T H.248.47]	Recommendation ITU-T H.248.47 (07/08), *Gateway Control Protocol: Statistic conditional reporting package*.
[ITU-T H.248.50]	Recommendation ITU-T H.248.50 (09/10), *Gateway Control Protocol: NAT traversal toolkit packages*.
[ITU-T H.248.64]	Recommendation ITU-T H.248.64 (12/09), *Gateway Control Protocol:* IP router packages.
[ITU-T H.248.81]	Recommendation ITU-T H.248.81 Amendment 1 (13/xx), *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.
[IETF RFC 3168]	IETF RFC 3168 (2001), *The Addition of Explicit Congestion Notification (ECN) to IP*.

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

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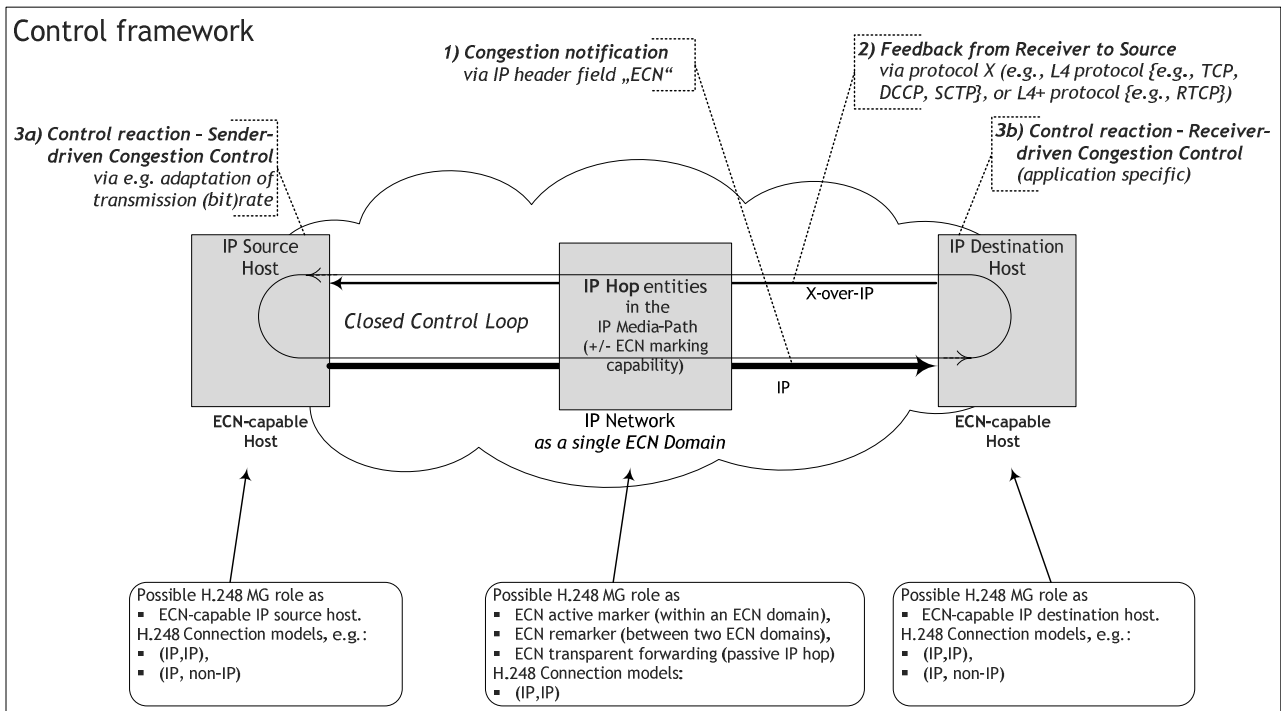
NOTE – The thick arrow shows the unidirectional IP packet path (where hop entities may provide ECN-CE marking. The thin arrow in reverse direction indicates protocol X packets in feedback direction.

**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.
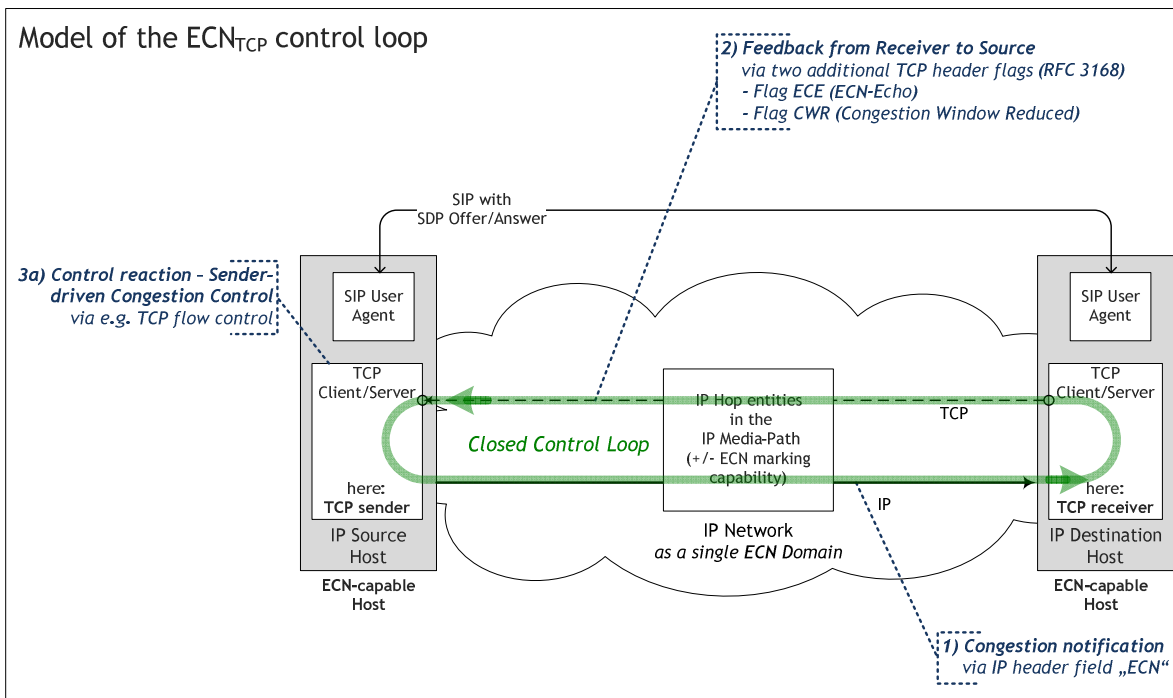
Figure 2 – Use of ECN with TCP traffic

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].
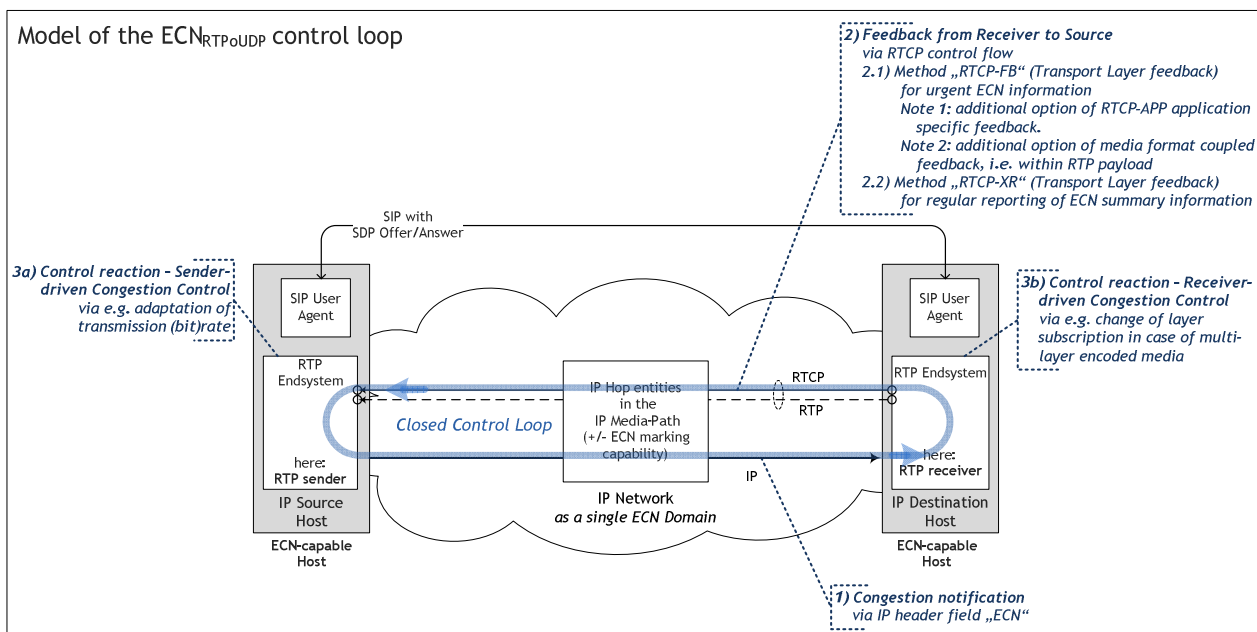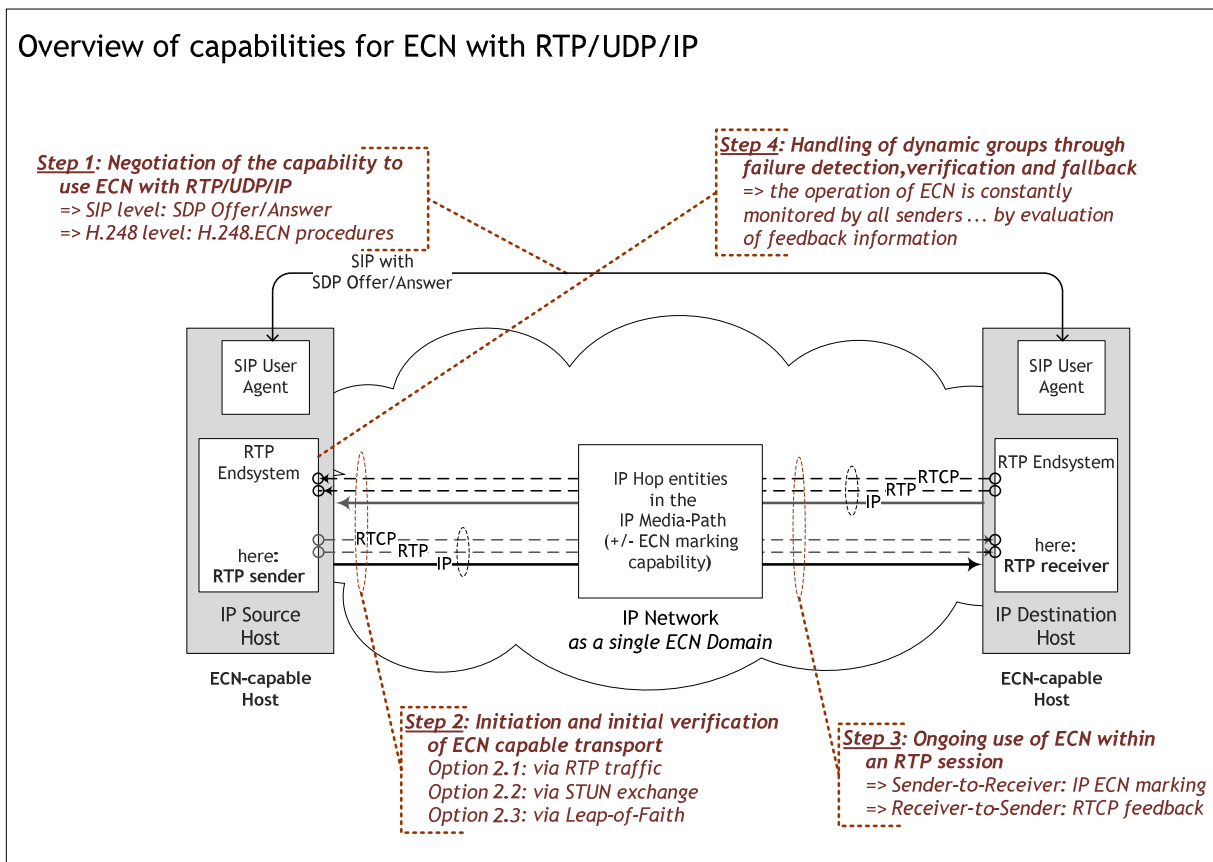

Figure 3 – Use of ECN with RTP-over-UDP traffic

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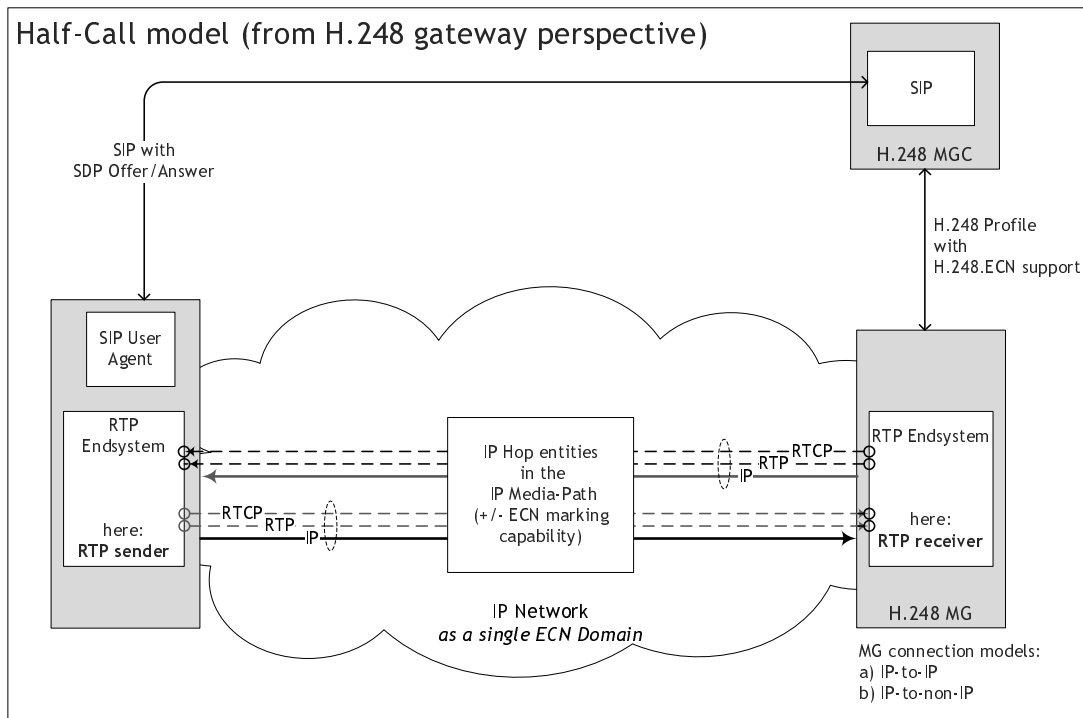
Figure 5 – Control plane example with H.248 network elements at the edge of an ECN domain

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).

Figure 6 – Peering separate ECN domains by H.248 (IP,IP) MGs
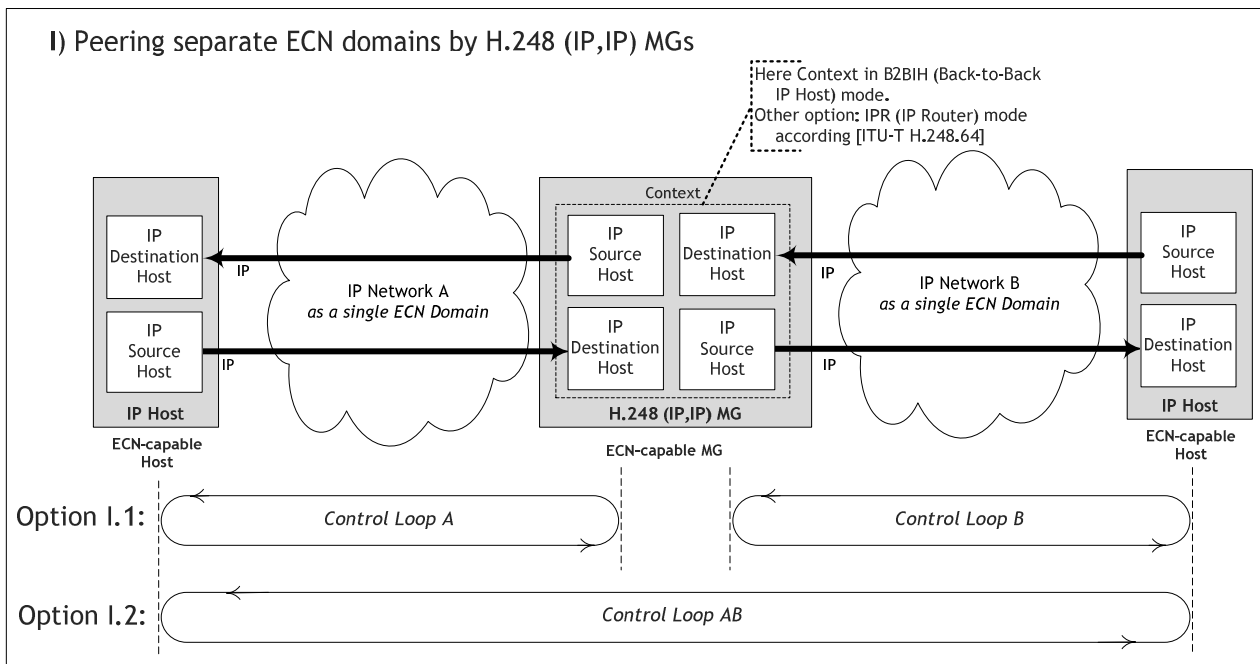
NOTE – The IP topologies are basically associated with the H.248 Stream level. Above figure illustrates an example on Context level (referred to the IP topology models according clause 3.2.1 (B2BIH) and clause 6.5.1 (IP router) of [ITU-T H.248.64]).

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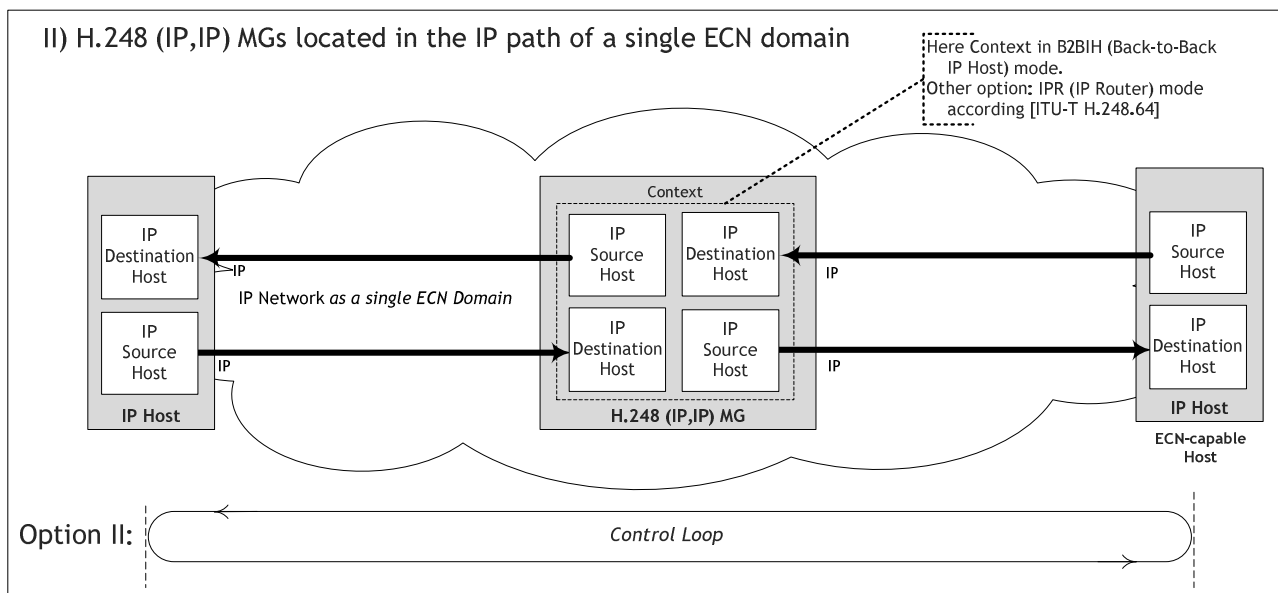
Figure 7 – H.248 (IP,IP) MGs located in the IP path of a single ECN domain

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

Package Name: ECN for RTP-over-UDP Support Package

Package ID: ecnrous (0x010b)

Description: 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.

Version: 1

Extends: None.

7.1 Properties

7.1.1 ECN Enabled

Property Name: ECN Enabled

Property ID: ecnen (0x0001)

Description: This property allows the MGC to indicate whether or not ECN is enabled on a Stream.

Type: Boolean

Possible values: True ECN is enabled

False ECN is not enabled

Default: False.

Defined in: Local/Remote

Characteristics: Read/Write

7.1.2 Congestion Response Method

Property Name: Congestion response method

Property ID: crm (0x0002)

Description: 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].

Type: Enumeration

Possible values: "SDCC" (0x0001) Sender Driven Congestion Control

"RDCC" (0x0002) Receiver Driven Congestion Control

"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

Property ID:	congestmark (0x0006)
Description:	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.
Type:	Enumeration
Possible values:	"mgdet" (0x0001): The MG determines if ECN Congestion Marking is enabled.
	"cemark" (0x0002): ECN Congestion marking is enabled.
	"nomark" (0x0003): ECN Congestion marking is not enabled.
Default:	Provisioned.
Defined in:	Local / Remote
	NOTE: the property is irrelevant when included in the Local Descriptor.
Characteristics:	Read Only

7.1.7 ECN SDP Usage

Property Name:	ECN SDP Usage
Property ID:	ecnsdp (0x0007)
Description:	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.
Type:	Enumeration
Possible values:	"P" (0x0001) The properties in clauses 7.1.1, 7.1.3, 7.1.4 and 7.1.5.
	"S" (0x0002) The SDP "**a=ecn-capable-rtp**" attribute.
	"B" (0x0003) Either of the above two methods.
Default:	Provisioned.
Defined in:	Termination State (Root Termination Only)
Characteristics:	Read Only

7.2 Events

7.2.1 ECN Failure

Event Name:	ECN Failure
Event ID:	fail (0x0001)
Description:	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

Parameter Name:	Failure Type
Parameter ID:	type (0x0001)
Description:	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].
Type:	Enumeration
Optional:	No
Possible values:	INIT (0x0001): Failure during initiation Phase USE (0x0002): Failure during ongoing use phase
Default:	None.

7.2.1.2.2 Media Sender SSRC

Parameter Name:	Media Sender SSRC
Parameter ID:	ssrc (0x0002)
Description:	This parameter contains the SSRC of the media sender with whom ECN has failed.
Type:	Integer
Optional:	Yes
Possible values:	SSRC as per [IETF RFC 3550].
Default:	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)

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

7.4.2   CE Counter

Statistic Name:	CE Counter
Statistic ID:	cecount (0x0002)
Description:	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 *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

7.4.3   ECT 0 Counter

Statistic Name:	ECT0 Counter
Statistic ID:	ectzero (0x0003)
Description:	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 *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

7.4.4   ECT 1 Counter

Statistic Name:	ECT1 Counter
Statistic ID:	ectone (0x0004)
Description:	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 *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

7.4.5   Not-ECT Counter

Statistic Name:	Not-ECT Counter
Statistic ID:	notetc (0x0005)
Description:	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 *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

7.4.6 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/ecnsdp*) 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
		CP-100460	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
		CP-110368	0026	1	Interworking with Non-3GPP ECN networks		
		CP-110368	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
2012-12	CT#58	CP-120723	0039	1	Ix interface updates of ECN Support Package	10.4.0	10.5.0

History

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V10.0.0	April 2011	Publication
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