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SERIES Q: SWITCHING AND SIGNALLING

Signalling requirements and protocols for the NGN –
Resource control protocols

**Resource control protocol No. 3 – Protocol at
the interface between a policy decision physical
entity (PD-PE) and a policy enforcement
physical entity (PE-PE) (Rw interface):
ITU-T H.248 alternative version 2**

Recommendation ITU-T Q.3303.2



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Recommendation ITU-T Q.3303.2

Resource control protocol No. 3 – Protocol at the interface between a policy decision physical entity (PD-PE) and a policy enforcement physical entity (PE-PE) (Rw interface): ITU-T H.248 alternative version 2

Summary

Recommendation ITU-T Q.3303.2 specifies the resource control protocol No. 3 (rcp3) ITU-T H.248 profile used at the Rw interface, i.e., between the policy decision physical entity (PD-PE) and the policy enforcement physical entity (PE-PE) in the resource and admission control functional block.

This protocol profile allows the final admission policy decisions to be installed (either push or pull mode) to a PE-PE from a PD-PE, supports resource control for both fixed and mobile networks and supports the network address and port translation (NAPT) control and network address translation (NAT) traversal at the PE-PEs as needed. It satisfies the requirements for information flows across the Rw reference point as specified in clause 8.2 of Recommendation ITU-T Y.2111. It is also used to control the PE-PE in transport devices, including quality of service (QoS) resource control (e.g., packet marking, filtering and policing) and gate control.

This version of the Recommendation improves the published version 1 in 2007 and adds additional features to satisfy the full requirements as defined in Recommendation ITU-T Y.2111, based on the developments and progresses of both ITU-T Y.2111 and ITU-T H.248 protocols. New functional packages as well as their procedures are introduced in this version such as "hanging termination detection", "statistics conditional reporting", "IP realm availability" and "Pull mode". Meanwhile, a number of changes are made to refine the profile definitions and the details.

History

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The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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As of the date of approval of this Recommendation, ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

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Recommendation ITU-T Q.3303.2

Resource control protocol No. 3 – Protocol at the interface between a policy decision physical entity (PD-PE) and a policy enforcement physical entity (PE-PE) (Rw interface): ITU-T H.248 alternative version 2

1 Scope

This Recommendation provides the stage 3 technical specifications for the ITU-T H.248 profile of the Rw interface. The functional requirements and the stage 2 specifications of the Rw interface are contained in [ITU-T Y.2111]. The Rw interface is the interface between a policy decision physical entity (PD-PE) and a policy enforcement physical entity (PE-PE).

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 H.248.1] | Recommendation ITU-T H.248.1 (2013), <i>Gateway control protocol: Version 3</i> . |
| [ITU-T H.248.4] | Recommendation ITU-T H.248.4 (2009), <i>Gateway control protocol: Transport over Stream Control Transmission Protocol (SCTP)</i> . |
| [ITU-T H.248.8] | Recommendation ITU-T H.248.8 (2013), <i>Gateway control protocol: Error code and service change reason description</i> . |
| [ITU-T H.248.11] | Recommendation ITU-T H.248.11 (2013), <i>Gateway control protocol: Media gateway overload control package</i> . |
| [ITU-T H.248.14] | Recommendation ITU-T H.248.14 (2009), <i>Gateway control protocol: Inactivity timer package</i> . |
| [ITU-T H.248.36] | Recommendation ITU-T H.248.36 (2013), <i>Gateway control protocol: Hanging Termination Detection package</i> . |
| [ITU-T H.248.37] | Recommendation ITU-T H.248.37 (2008), <i>Gateway control protocol: IP NAPT traversal package</i> . |
| [ITU-T H.248.40] | Recommendation ITU-T H.248.40 (2013), <i>Gateway control protocol: Application data inactivity detection package</i> . |
| [ITU-T H.248.41] | Recommendation ITU-T H.248.41 (2013), <i>Gateway control protocol: IP domain connection package</i> . |
| [ITU-T H.248.43] | Recommendation ITU-T H.248.43 (2008), <i>Gateway control protocol: Packages for gate management and gate control</i> . |
| [ITU-T H.248.45] | Recommendation ITU-T H.248.45 (2006), <i>Gateway control protocol: MGC information package</i> . |
| [ITU-T H.248.47] | Recommendation ITU-T H.248.47 (2008), <i>Gateway control protocol: Statistic conditional reporting package</i> . |

[ITU-T H.248.48]	Recommendation ITU-T H.248.48 (2008), <i>Gateway control protocol: Statistic conditional reporting package</i> .
[ITU-T H.248.49]	Recommendation ITU-T H.248.49 (2007), <i>Gateway control protocol: Session description protocol RFC and capabilities packages</i> .
[ITU-T H.248.52]	Recommendation ITU-T H.248.52 (2008) Amendment 1 (2009), <i>Gateway control protocol: QoS Support packages</i> .
[ITU-T H.248.53]	Recommendation ITU-T H.248.53 (2009), <i>Gateway control protocol: Traffic Management packages</i> .
[ITU-T H.248.54]	Recommendation ITU-T H.248.54 (2007), <i>Gateway control protocol: MPLS support package</i> .
[ITU-T H.248.55]	Recommendation ITU-T H.248.55 (2008), <i>Gateway control protocol: Generic pull mode package</i> .
[ITU-T H.248.56]	Recommendation ITU-T H.248.56 (2007), <i>Gateway control protocol: Packages for virtual private network support</i> .
[ITU-T H.248.57]	Recommendation ITU-T H.248.57 (2013), <i>Gateway control protocol: RTP control protocol package</i> .
[ITU-T H.248.58]	Recommendation ITU-T H.248.58 (2008), <i>Gateway control protocol: Packages for application level H.248 statistics</i> .
[ITU-T H.248.65]	Recommendation ITU-T H.248.65 (2009) <i>Gateway control protocol: Support of the resource reservation protocol</i> .
[ITU-T Y.2012]	Recommendation ITU-T Y.2012 (2010), <i>Functional requirements and architecture of next generation networks</i> ¹ .
[ITU-T Y.2111]	Recommendation ITU-T Y.2111 (2011), <i>Resource and admission control functions in next generation networks</i> .
[IETF RFC 1123]	IETF RFC 1123 (1989), <i>Requirements for Internet Hosts -- Application and Support</i> .
[IETF RFC 3264]	IETF RFC 3264 (2002), <i>An Offer/Answer Model with Session Description Protocol (SDP)</i> .
[IETF RFC 4566]	IETF RFC 4566 (2006), <i>SDP: Session Description Protocol</i> .
[IETF RFC 5234]	IETF RFC 5234 (2008), <i>Augmented BNF for Syntax Specifications: ABNF</i> .

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 gate: A construct used to enable or disable the forwarding of IP packets based on the policy decision. A gate is identified by the classifier (e.g., IPv4 5-tuple) and direction of a media flow or a group of media flows that in conformance to the same set of policy decisions.

NOTE – The ITU-T H.248 gate (and pinhole) concept is depicted in Annex A of [b-ETSI ES 283 018].

3.2.2 gate control: The operation of opening or closing a gate. When a gate is open, the packets in the media flows are allowed to pass through; when a gate is closed, the packets in the media flows are not allowed to pass through.

3.2.3 IP-to-IP interworking modes: The available session description protocol (SDP) information elements and values in the signalled SDP "media description" (mainly "m=" and "a=" lines) by the policy decision entity (MGC), may be used to categorize following interworking modes from policy enforcement entity (MG) perspective:

- (1) **"Media-agnostic":** the "m=" line values of *media type* (<media>) and *media format* (<fmt>) are not allowing to terminate the PE-PE (MG) on the transported "media" information.
- (2) **"Media-aware":** the "m=" line values of *media type* (<media>), *transport protocol* (<proto>) and *media format* (<fmt>) unambiguously define the entire protocol stack of the ITU-T H.248 IP termination, i.e., the PE-PE (MG) is cognizant of transported "media" information and the underlying transport protocol type.
- (3) **"Transport protocol-agnostic"** (or briefly **"transport-agnostic"**): the PE-PE (MG) may not conclude from signalled SDP information elements on the transported IP payload information (Note 1).
- (4) **"Transport protocol-aware"** (or briefly **"transport-aware"**): the value of the IP *protocol* field is indicated by the signalled SDP information elements, e.g., by the "m=" line value of the *transport protocol* (<proto>) field.

NOTE – The PE-PE (MG) could principally derive the used transport protocol by analysing the protocol field (<http://www.iana.org/assignments/protocol-numbers>) in the IP header, but such a function is beyond ITU-T H.248. The PE-PE (MG) is still transport protocol-agnostic from ITU-T H.248 point of view.

3.2.4 media flow: A unidirectional media stream, which is specified by two endpoint identifiers and bandwidth, as well as class of service if needed.

3.2.5 pinhole: Configuration of two associated ITU-T H.248 IP terminations within the same ITU-T H.248 context, which allows and prohibits unidirectional forwarding of IP packets under specified conditions.

NOTE 1 – A pinhole may also be referred to as a "gate".

NOTE 2 – E.g., address tuple.

NOTE 3 – See [ITU-T H.248.37].

3.2.6 policy decision physical entity (PD-PE): The PD-PE is an implemented instance of the policy decision functional entity (PD-FE) as identified in [ITU-T Y.2111].

3.2.7 policy enforcement physical entity (PE-PE): The PE-PE is an implemented instance of the policy enforcement functional entity (PE-FE) as identified in [ITU-T Y.2111].

3.2.8 transcoding: Translation from one type of encoded media format to another media format (examples: G.711 A-law to μ -law or vice versa; ITU-T G.711 to ITU-T G.726-40K; ITU-T G.729 to adaptive multi-rate (AMR) with 4.75 rate; ITU-T G.711 to a broadband codec that operates at 256 kbps, etc.).

NOTE – The definition of 'transcoding' is based on the definition in clause 3 of [ITU-T V.152].

Transcoding belongs to the category of "media aware" IP-to-IP interworking (see above).

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ABNF Augmented Backus-Naur Form

AC Admission Control

AH	Authentication Header
AMR	Adaptive Multi-Rate
API	Application Programming Interface
AVP	Attribute-Value Pair
B2BIH	Back-to-Back IP Host
B2BRE	Back-to-Back RTP EndsysteM
BGF	Gateway Function
BGW	Border Gateway
CBR	Constant Bit Rate
CNAME	Canonical Name
CoAC	Context Admission Control
CPE	Customer Premises Equipment
DiffServ	Differentiated Services
ESP	Encapsulation Security Payload
GoS	Grade of Service
HW	Hardware
ID	Identifier
IBCF	Interconnection Border Control Function
ICMP	Internet control message protocol
IEPS	International Emergency Preference Scheme
IMS	IP Multimedia Subsystem
IP	Internet Protocol
IPR	IP Router
IPsec	IP security
LAN	Local Area Network
LCD	LocalControl Descriptor
LD	Local Descriptor
LSP	Label Switched Path
MG	Media Gateway
MGC	Media Gateway Controller
MIB	Management Information Base
MID	Message Identifier (ITU-T H.248)
MPLS	Multi-Protocol Label Switching
NAPT	Network Address and Port Translation
NAPT-PT	NAPT and Protocol Translation
NAT	Network Address Translation
PCI	Protocol Control Information

PD-PE	Policy Decision Physical Entity
PDU	Protocol Data Unit
PE-PE	Policy Enforcement Physical Entity
PHB	Per-Hop Behaviour
QoS	Quality of Service
RD	Remote Descriptor
RP	Reporting Point
RSVP	Resource Reservation Protocol
RTCP	RTP Control Protocol
RTCP XR	RTP Control Protocol extended Report
RTP	Real-time Transport Protocol
SCF	Service Control Functions
SCTP	Stream Control Transmission Protocol
SDES	Source Description
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SLA	Service Level Agreement
SNMP	Simple Network Management Protocol
SPDF	Service Policy Decision Function
SRTP	Secure RTP
StAC	Stream Admission Control
SSRC	Synchronization Source
THF	Topology Hiding Function
THIG	Topology Hiding Gateway
TLS	Transport Level Security
TTL	Time-To-Live
UDP	User Datagram Protocol
UE	User Equipment
VBR	Variable Bit Rate
VLAN	Virtual LAN
VPN	Virtual Private Network
XR	Extended Report

5 Conventions

None.

6 Rw interface protocol specification (ITU-T H.248 profile description)

The protocol specification relates to the definition of an ITU-T H.248 profile applicable for use at an ITU-T H.248-based Rw interface. The profile concept is inherently part of ITU-T H.248 (see clause 13 of [ITU-T H.248.1]). This profile is based on [b-ETSI TS 183 018] and follows the same structure (which is in line with the profile definition template according to Appendix III of [ITU-T H.248.1]).

The PD-PE has the "H.248 MGC" role in the scope of this ITU-T H.248 profile.

NOTE 1 – The function of PD-PE corresponds to the service policy decision function (SPDF) in [b-ETSI TS 183 018].

The PE-PE has the "H.248 MG" role in the scope of this ITU-T H.248 profile.

NOTE 2 – The function of PE-PD corresponds to the border gateway function (BGF) in [b-ETSI TS 183 018].

6.1 Profile identification

Table 6-1 – Profile identification

Profile name:	ITU_PE-PE
Version:	2

This ITU-T H.248 Profile for Rw interface is based on Profile "ETSI_BGF/3" as defined in [b-ETSI TS 183 018].

6.2 Gateway control protocol version

Recommendation ITU-T H.248.1 Version 3 should be applied to the Rw interface.

NOTE – Version 3 of the ITU-T H.248 protocol is needed, due to the possible usage of stream statistics and large size user datagram protocol (UDP) payload.

6.3 Connection model

Table 6-2 – Connection model

Maximum number of contexts	Provisioned
Maximum number of terminations per context	At least 2
Allowed terminations type combinations	(IP, IP)

6.4 Context attributes

Table 6-3 – Context attributes

Context attribute	Supported	Values supported
Topology	No	NA
Priority indicator	Yes	0-15
Emergency indicator	Yes	ON/OFF
IEPS indicator	No	NA
ContextAttribute descriptor	No	NA
ContextIdList parameter	No	NA
AND/OR context attribute	No	NA

6.5 Terminations

6.5.1 Termination names

6.5.1.1 IP termination

6.5.1.1.1 Overview and prose specification

The TerminationID structure shall follow the guidelines of ITU-T H.248 and shall be based on four fields:

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

The individual fields are described and defined in Table 6-4.

Table 6-4 – 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 (0-65 535)	No	Yes
Interface	Logical or physical interface to a network to/from which the termination will be sending/receiving media (Notes 1 and 2).	String of maximum 51 alphanumeric characters	Yes (Note 5)	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 – In version 1 of this profile, there was a tacit assumption that the media gateway controller (MGC) used a CHOOSE wildcard in an ADD request command. In this version, the MGC shall always use CHOOSE in an ADD request command. If not, the media gateway (MG) shall reply with an error descriptor using error code #501 "Not Implemented". See also clause 6.5.1.1.1.3.

NOTE 5 – 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 – A specific address space may be associated with each interface or group of interfaces. In such cases, by specifying a partially wildcarded TerminationID in an ADD command, the PD-PE has the ability to choose the address space in which the PE-PE will allocate an IP address for the termination (e.g., ip/<group>/<interface>/\$. The association of a TerminationID with a dedicated address space is related to "IP domain indication", which is also provided by the ipdc/realm property, see clause 6.16.1.7.

ITU-T H.248 wildcarding may be applied on IP termination identifiers. Wildcarding is limited according to the two columns on the right hand side.

6.5.1.1.1.1 Combined usage of fields group and interface

There are two potential relationships between <group> and <interface> within the TerminationID structure (see Figure 6-1):

- a) *strictly hierarchical*: a single "interface" is completely associated to a dedicated "group" e.g., may be driven for instance by hardware architecture or addressing schemes with the goal of minimizing ServiceChange command load by using wildcards such as ip/<group>/* for potential hardware (HW) failures that may lead to issuing a single ServiceChange command rather than multiple ServiceChange commands.

- b) *partially hierarchical*: an "interface" is distributed over multiple "groups"
e.g., A logical partition concept may be driven for instance for selective auditing with the goal of minimizing the AuditReply to be of a manageable size by having the MGC to allocate an adequate number of terminations within a <group>. Therefore, audits could be paced for example: ip/1/*, ip/2/*, ..., ip/n/*.

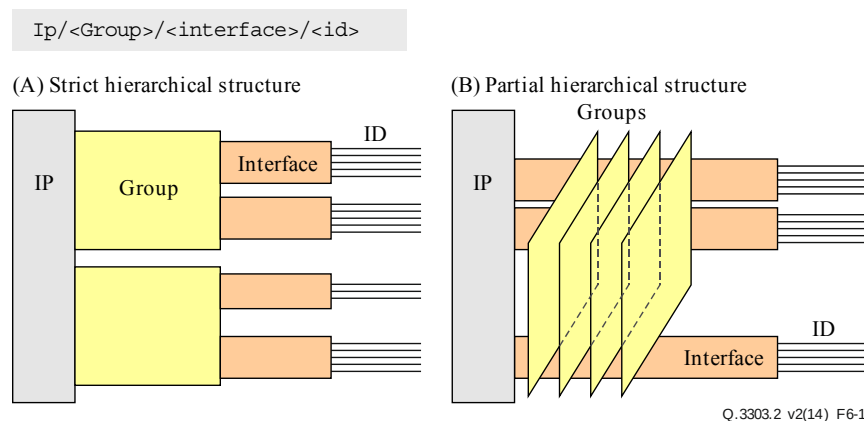


Figure 6-1 – Group/Interface relationships for the structure of terminationIDs

The following examples in Tables 6-5 and 6-6 depict the advantages that each group/interface relationship may facilitate.

Table 6-5 – Examples of group/interface relationship in ServiceChange

Semantic of termination name	ServiceChange command (e.g., due to a HW failure)	
Strictly hierarchical	Upon a HW failure the command issued is (by MG): <pre>ServiceChange=ip/1/*{Services{ Method=Restart,Reason="906" Version=3,Profile = ITU_PE-PE _2}}},</pre> a single wildcarded command is possible (facilitated by a strict hierarchical relationship).	
Partially hierarchical	Upon a HW failure the command issued is (by MG): <pre>ServiceChange=ip/*/1/*{Services{ Method=Forced,Reason="906" }}}, ServiceChange=ip/*/2/*{Services{ Method=Forced,Reason="906" }}}, ... ServiceChange=ip/*/x/*{Services{ Method=Forced,Reason="906" }}}</pre> ... a single wildcarded command is not always possible when not using a strict hierarchical relationship	

Table 6-6 – Examples of termination ID usage in AuditValue

Usage of termination ID structure	AuditValue command (e.g., Requesting a list of context IDs present in the MG where n and N are number of contexts in the AuditValue replies and $n \leq N$)
Neither group nor interface levels specified in request	The command (from MGC): Context=* {AuditValue=Root{Audit{}}} Returns: Context=1 {AuditValue=ip/1/11/101 {} ,AuditValue=ip/1/12/102 {}}, Context=2 {AuditValue=ip/1/21/201 {} ,AuditValue=ip/1/22/202 {}}, Context=3 {AuditValue=ip/1/31/301 {} ,AuditValue=ip/1/32/302 {}}, ... Context=N {AuditValue=ip/256/11/504 {} ,AuditValue=ip/256/12/534 {}} ... this could potentially return very large AuditValue Replies.
Group level specified in request	The command (by MGC): Context=* {AuditValue=ip/1/* {Audit{}}} Returns: Context=1 {AuditValue=ip/1/11/101 {} ,AuditValue=ip/1/12/102 {}}, ... Context=n {AuditValue=ip/1/51/121 {} ,AuditValue=ip/1/52/122 {}} ... and this command would be repeated for each group. (facilitated by loose hierarchical relationship).

6.5.1.1.1.2 Optimization of call-independent procedures

The CHOOSE wildcard for "Interface" is introduced by this version of the profile.

The MGC may optimize (Note 1) call-independent procedures, e.g., based on the AuditValue command, by fully controlling the value allocation for the field Group.

NOTE 1 – "Optimization" could e.g., mean a load shaping function concerning ITU-T H.248 processing load.

The MG may optimize (Note 2) call-independent procedures, e.g., based on the ServiceChange command, via full control over the value allocation for field Interface.

NOTE 2 – "Optimization" may allow single wildcarded commands, see discussion in Tables 6-5 and 6-6.

6.5.1.1.1.3 Field "Id": Usage of wildcard CHOOSE or not

The CHOOSE wildcard for "Id" must be applied in the ADD.request command. It is the MGs responsibility for managing the value range of this logical resource.

6.5.1.1.2 Syntactical specification

6.5.1.1.2.1 ABNF grammar for ITU-T H.248 text encoding mode

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

ABNF coding:

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

```

6.5.2 Multiplexed terminations

Table 6-7 – Multiplexed terminations

MultiplexTerminations supported?	No
----------------------------------	----

6.6 Descriptors

6.6.1 TerminationState Descriptor

Table 6-8 – ServiceState property

ServiceState property used:	No
-----------------------------	----

NOTE 1 – All ITU-T H.248 Terminations have a ServiceState property according to [ITU-T H.248.1], but explicit usage of the TerminationState Descriptor ServiceState property is not required by this profile. ServiceState changes can still occur, however, and be indicated in ServiceChange commands.

NOTE 2 – The value of the ServiceState property may be implicitly changed by ServiceChange procedures, or the value may be read by audit procedures, i.e., "Yes" for ServiceStates "InService" and "OutOfService" due to AuditValue and ServiceChange commands or "No" for ServiceState "Test".

Table 6-9 – EventBufferControl property

EventBufferControl property used:	No
-----------------------------------	----

6.6.2 Stream Descriptor

Table 6-10 – Stream Descriptor

Maximum number of streams per termination type	IP	5
--	----	---

Table 6-11 – Stream configuration

Stream configuration	All configurations are allowed.
----------------------	---------------------------------

6.6.2.1 LocalControl Descriptor (LCD)

Table 6-12 – LocalControl Descriptor

If not generic list appropriate termination and stream types		Termination type	Stream type
ReserveGroup used	No	–	–
ReserveValue used	No	–	–

Table 6-13 – Termination type

Termination type	Stream type	Allowed StreamMode values
IP	RTP/AVP	SendOnly, RecvOnly, SendRecv, Inactive
	TCP	SendRecv, Inactive
	UDPTL	SendRecv, Inactive
	UDP	SendOnly, RecvOnly, SendRecvInactive
NOTE – Other stream types are for further study.		

6.6.3 Events Descriptor

Table 6-14 – Events Descriptor

Events that can be set based on termination types and stream types	Yes		
If Yes	Event ID	Termination type	Stream type
	See clause 6.13.2.1 • g/cause	All except ROOT	Any
	See clause 6.13.2.3 • nt/netfail • nt/qualert	All except ROOT	Any
	See clause 6.13.2.11 • it/ito	Only ROOT	Not applicable
	See clause 6.13.2.16 • adid/ipstop	All except ROOT	Any
	See clause 6.13.2.14 • ocp/mg_overload	Only ROOT	Not applicable
	See clause 6.13.2.17 • hangterm/thb	All except ROOT	Not applicable
	See clause 6.13.2.18 • scr/cr	All except ROOT	Not applicable
	See clause 6.13.2.1 • ipra/arc	Only ROOT	Not applicable

Table 6-15 – EventBuffer control

EventBuffer control used	No
---------------------------------	----

Table 6-16 – KeepActive

KeepActive used on events	No
----------------------------------	----

Table 6-17 – Embedded events and signals

Embedded events in an Events Descriptor	No
Embedded signals in an Events Descriptor	No

Table 6-18 – Regulated embedded events

Regulated embedded events are triggered on	None
---	------

Table 6-19 – ResetEventsDescriptor

ResetEventsDescriptor used with events	None
---	------

Table 6-20 – NotifyImmediate, NotifyRegulated and NeverNotify

NotifyImmediate	All events
NotifyRegulated	None
NeverNotify	None

6.6.4 EventBuffer Descriptor

Table 6-21 – EventBuffer Descriptor

EventBuffer Descriptor used	No
------------------------------------	----

6.6.5 Signals Descriptor

Table 6-22 – Signals Descriptor

Signals that can be set and are dependent on termination or streams types	Yes		
If yes	Signal ID	Termination type	Stream type/ID
	ipnapt/*	All except ROOT	Any

Table 6-23 – Signals lists

Signals lists supported	No
--------------------------------	----

Table 6-24 – Signals type and duration

Signal type and duration supported	No
---	----

Table 6-25 – Signals direction

Signal direction supported	No
-----------------------------------	----

Table 6-26 – NotifyCompletion and RequestID

NotifyCompletion supported	No
RequestID parameter supported	No

Table 6-27 – Simultaneously played signals

Signals played simultaneously	No
--------------------------------------	----

Table 6-28 – KeepActive

KeepActive used on signals	No
-----------------------------------	----

6.6.6 DigitMap Descriptor

Table 6-29 – DigitMap Descriptor

DigitMaps supported	No
----------------------------	----

6.6.7 Statistics Descriptor

Table 6-30 – Statistics Descriptor

Statistics supported on	Stream
--------------------------------	--------

Table 6-31 – Statistics reported on subtract

Statistics reported on subtract	Yes	
If yes	Statistic IDs reported	All (see clause 6.13 for details)

6.6.8 ObservedEvents Descriptor

Table 6-32 – ObservedEvents Descriptor

Event detection time supported	No
---------------------------------------	----

6.6.9 Topology Descriptor

Table 6-33 – Topology Descriptor

Allowed triples	Not applicable.
------------------------	-----------------

6.6.10 Error Descriptor

Table 6-34 – Error codes sent by MGC

Supported ITU-T H.248.8 error codes	All
Supported error codes defined in packages	All error codes defined in supported packages need to be supported.

Table 6-35 – Error codes sent by MG

Supported ITU-T H.248.8 error codes	All with exception of • #514 "Media gateway cannot send the specified announcement" • #518 "Event buffer full" • #519 "Out of space to store digit map" • #520 "Digit map undefined in the MG" • #522 "Functionality requested in topology triple not supported"
Supported error codes defined in packages	All error codes defined in supported packages need to be supported.

6.7 Command API

Introductory note:

Tables 6-36 to 6-38 provide a summary overview of clauses 6.6 and 6.7 concerning descriptors and commands respectively. Where there are discrepancies between these tables and the corresponding text in clauses 6.6 and 6.7, the text takes precedence over those described in these tables.

Table 6-36 shows in which direction commands are sent, with which terminations they can be associated with and which wildcard options are supported for the specific command.

Table 6-36 – Commands and terminations

Command	Sent by	Used on termination type		Wildcard support	
		IP	ROOT	W–	O–
Add	PD–PE	Yes	No	No	No
AuditCapabilities	–	–	–	–	–
AuditValue	PD–PE	Yes	Yes	No	Yes
Modify	PD–PE	Yes	Yes	No	No
Move	–	–	–	–	–
Notify	PE–PE	Yes	Yes	No	No
ServiceChange	PE–PE	Yes	Yes	No	No
Subtract	PD–PE	Yes	No	Yes	No
NOTE 1 – O– indicates an optional command					
NOTE 2 – W– indicates a wildcarded response to a command					

Table 6-36 shows for which termination types a specific descriptor can be applied and Tables 6-37 and 6-38 show with which commands and replies the descriptor can be used, respectively.

Table 6-37 – Descriptors and requests

Descriptor type (Note 1)	Termination type							
	Root	IP						
Audit	Yes	Yes						
Error								
Events	Yes	Yes						
Local		Yes						
LocalControl		Yes						
Media	Yes (Note 2)	Yes						
ObservedEvents	Yes	Yes						
Packages	Yes							
ServiceChange	Yes	Yes					Yes	
Signals		Yes						
Statistics		Yes						
Stream		Yes						
TerminationState	Yes (Note 2)							
NOTE 1 – Only ITU-T H.248 descriptors supported within this ITU-T H.248 profile specification are shown.								
NOTE 2 – E.g., Base Root package properties.								

Table 6-38 – Descriptors and replies

Descriptor type (Note 1)	Termination type							
	Root	IP	Add					
Audit								
Error	Yes	Yes						
Events	Yes	Yes						
Local								
LocalControl (Note 2)		Yes						
Media	Yes	Yes						
ObservedEvents								
Packages	Yes							
Remote								
ServiceChange	Yes	Yes						
Signals (Note 3)								

Table 6-38 – Descriptors and replies

Descriptor type (Note 1)	Termination type							
	Root	IP	Add					
Statistics		Yes						
Stream		Yes						
TerminationState	Yes							
NOTE 1 – Only ITU-T H.248 descriptors supported within this ITU-T H.248 profile specification are shown. NOTE 2 – According to clause 6.7.5, auditing of mgcinfo/db ITU-T H.248 property in LocalControl is required. NOTE 3 – According to clause 6.7.5, auditing of ITU-T H.248 signals descriptors is not required.								

It is seen that an Error Descriptor may be returned in any command reply and thus the Error Descriptor is not included in any subsequent command reply table.

6.7.1 Add

Table 6-39 – Descriptors used by Add request

Descriptors used by Add request	Media (Stream(LocalControl, Statistics, Local, Remote)), Event, Signals
NOTE – Statistics are enabled by default. The MGC may explicitly request or suppress statistics generation for individual streams or terminations by inclusion of the Statistics Descriptor in the Add request command (see clause 7.1.15 of [ITU-T H.248.1]).	

Table 6-40 – Descriptors used by Add reply

Descriptors used by Add reply	Media (Stream(Local))
--------------------------------------	-----------------------

6.7.2 Modify

Table 6-41 – Descriptors used by Modify request

Descriptors used by Modify request	Media (TerminationState, Stream(LocalControl, statistics, Local, Remote)), Audit(Media(Stream(Statistics))), Signals, Event
---	--

Table 6-42 – Descriptors used by Modify reply

Descriptors used by Modify reply	Media(Stream(Local Statistics))
---	---------------------------------

6.7.3 Subtract

Table 6-43 – Descriptors used by Subtract request

Descriptors used by Subtract request	Audit () OR NONE
NOTE – This profile version supports reporting of statistics on all streams or none of the streams. Reporting and disabling of statistics from a subset of the streams in case of multiple streams is not supported by this profile version. Termination level statistics are not supported.	

Table 6-44 – Descriptors used by Subtract reply

Descriptors used by Subtract reply	Media(Stream(Statistics)) or None
---	-----------------------------------

6.7.4 Move**Table 6-45 – Descriptors used by Move command**

Move command used	No
--------------------------	----

6.7.5 AuditValue**Table 6-46 –AuditValue**

Audited properties	Media(Termination state) (Note 1) Media(Stream(local control)) (Note 2)
Audited statistics	All
Audited signals	None
Audited events:	None
Packages audit possible	Yes
NOTE 1 – These are the root/*, seg/* and ipra/* properties. NOTE 2 – This is the mgcinfo/db property.	

6.7.6 AuditCapabilities**Table 6-47 – Descriptors used by AuditCapabilities command**

AuditCapabilities command used	No
---------------------------------------	----

6.7.7 Notify**Table 6-48 – Descriptors used by Notify request**

Descriptors used by Notify request	ObservedEvents
---	----------------

Table 6-49 – Descriptors used by Notify reply

Descriptors used by Notify reply	None
---	------

6.7.8 ServiceChange**Table 6-50 – ServiceChangeMethods and ServiceChangeReasons sent by MGC**

Service change methods supported	ServiceChange reasons supported
Restart	900, 901
Handoff	903

Table 6-51 – ServiceChangeMethods and ServiceChangeReasons sent by MG

Service change methods supported	ServiceChange reasons supported
Restart	900, 901, 902
Forced	904, 905, 906, 915
Disconnected	900
Graceful	905, 908
Failover	909
Handoff	903

Table 6-52 – ServiceChangeAddress

ServiceChangeAddress used	No
---------------------------	----

Table 6-53 – ServiceChangeDelay

ServiceChangeDelay used	Yes	
If yes	Valid time period	Provisioned

Table 6-54 – ServiceChange incomplete flag

ServiceChange incomplete flag used	No
------------------------------------	----

Table 6-55 – ServiceChangeVersion

Version used in ServiceChangeVersion	3
--------------------------------------	---

Table 6-56 – Profile negotiation

Profile negotiation as per ITU-T H.248.18	No
---	----

Table 6-57 – ServiceChangeMGCid

ServiceChangeMGCid used	Yes
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6.7.9 Manipulating and auditing context attributes

Table 6-58 – Context attributes manipulation and auditing

Context attributes manipulated	Emergency, Priority
Context attributes audited	None

6.8 Generic command syntax and encoding

Table 6-59 – Command encoding

Supported encodings	Text (Notes 1 and 2)
NOTE 1 – The receiver shall be capable of receiving both short token notation and long token notation on an ITU-T H.248 control association.	
NOTE 2 – The transmitter may select between long and short token forms per ITU-T H.248 control association.	

6.9 Transactions

Table 6-60 – Maximum number of Transaction Requests/Replies/TransResponseAcks/Segment

Maximum number of Transactions Requests/Replies/TransResponseAcks/Segment Replies per message	1
--	---

Table 6-61 – Maximum number of commands per Transaction request

Maximum number of commands per Transaction request	2
---	---

Table 6-62 – Maximum number of commands per Transaction reply

Maximum number of commands per Transaction reply	2
---	---

Table 6-63 – Optional commands

Commands able to be marked "Optional"	AuditValue
--	------------

Table 6-64 – Wildcarded commands

Commands able to be marked "Wildcarded"	Subtract
--	----------

Table 6-65 – Transaction timer

Transaction timer	Value
normalMGExecutionTime	Provisioned, changeable with Base Root package (see clause 6.13.2)
normalMGCEExecutionTime	Provisioned, changeable with Base Root package (see clause 6.13.2)
MGOrientedPendingLimit	Provisioned, changeable with Base Root package (see clause 6.13.2)
MGCORientedPendingLimit	Provisioned, changeable with Base Root package (see clause 6.13.2)
MGProvisionalResponseTimerValue	Provisioned, changeable with Base Root package (see clause 6.13.2)
MGCProvisionalResponseTimerValue	Provisioned, changeable with Base Root package (see clause 6.13.2)

6.10 Messages

It is recommended that MGC and MG names are formatted as fully qualified domain names. For example the domain name of the MGC may be formatted as `mgc1.whatever.net` and the name of the MG may be formatted as `mg1.whatever.net`.

The fully qualified domain name will be used by the MGC and MG as part of the "Message Identifier" in the ITU-T H.248 messages, which identifies the originator of the message.

6.11 Transport

Table 6-66 – Transport

Supported transports	SCTP (Recommended) UDP (Optional)
-----------------------------	-----------------------------------

Table 6-67 – Segmentation

Segmentation supported	SCTP: Inherent in transport UDP: Optional (dependent on support of Segmentation package, see clause 6.13.2.12)
-------------------------------	--

Table 6-68 – Control association

Control association monitoring supported:	Monitoring mechanism is dependent on used ITU-T H.248 transport (see Table 6-66): SCTP: Inherent capability of SCTP. UDP: ITU-T H.248.14 (MG-driven monitoring). Empty AuditValue on ROOT (MGC-driven monitoring).
--	---

6.12 Security

Table 6-69 – Security

Supported security	None
---------------------------	------

6.13 Packages

This clause includes details of the mandatory and optional ITU-T H.248 packages that are included in this profile. A MG supporting this profile must support all the mandatory packages and may support zero, some or all of the optional packages. The MGC may use the ITU-T H.248 packages audit mechanism to determine which of the optional packages are supported by the MG. The meaning of mandatory and optional packages and their properties, signals, events, and statistics is provided in Appendix III of [ITU-T H.248.1].

6.13.1 Overview

Table 6-70 – Mandatory packages

Mandatory packages		
Package name	Package ID	Version
Generic (clause E.1 of [ITU-T H.248.1])	g	2
Base Root (clause E.2 of [ITU-T H.248.1])	root	2
Network (clause E.11 of [ITU-T H.248.1])	nt	1
Differentiated services [ITU-T H.248.52]	ds	2
Gate management (Appendix I of [ITU-T H.248.43])	gm	1
Traffic management [ITU-T H.248.53]	tman	1
IP NAPTR traversal [ITU-T H.248.37]	ipnapt	1
IP domain connection [ITU-T H.248.41]	ipdc	1
Generic pull mode package [ITU-T H.248.55]	plm	1

Table 6-71 – Optional packages

Optional packages			
Package name	Package ID	Version	Support dependent on
MPLS [ITU-T H.248.54]	mpls	1	Support for MPLS label stacks, i.e., label switched paths (LSPs) terminated by the MG and related to the ITU-T H.248 termination.
VLAN [ITU-T H.248.56]	vlan	1	Support for virtual LAN (VLAN) tags and/or Ethernet priorities.
MGC information [ITU-T H.248.45]	mgcinfo	1	Support for MGC related recovery.
Inactivity timer [ITU-T H.248.14]	it	1	Applicable only for UDP transport (because UDP does not support any inherent keep alive mechanism).
Segmentation (clause E.14 of [ITU-T H.248.1])	seg	1	Applicable for UDP transport where sufficiently large messages are required to be supported.
RTP (clause E.12 of [ITU-T H.248.1])	rtp	1	Support of usage metering and statistics reporting. Particular package capabilities are only applicable for "media-aware" bearer connections.
Media gateway overload control [ITU-T H.248.11]	ocp	1	Support of message throttling, based on rate limitation, from MGC towards MG
Application data inactivity detection [ITU-T H.248.40]	adid	1	MGC requires to be explicitly informed of a cessation of an application data flow.

Table 6-71 – Optional packages

Optional packages			
Package name	Package ID	Version	Support dependent on
Hanging termination detection [ITU-T H.248.36]	hangterm	1	Support of hanging termination detection
Statistics conditional reporting [ITU-T H.248.47]	scr	2	Support of real time reporting of specific statistics based on a particular condition. This package may be supported as an operator option.
Gate management [ITU-T H.248.43]	gm	2	Support of filtering based on source port range
IP realm availability [ITU-T H.248.41]	ipra	1	Complements the IP domain connection package. Support of a mechanism allowing the MGC to discover the IP realms that are available at the MG at a certain time and on a mechanism allowing the MG to inform the MGC about change of availability of realms.
RTP application data package [ITU-T H.248.58]	rtpad	1	Support of usage metering and statistics reporting. Scope on traffic-volume based measurement of real-time transport protocol (RTP) application data (i.e., the media stream).
IP domain connection Latch statistics [ITU-T H.248.37]	ipdclstat	1	MGC to address specific IP realm NOTE – Complements the IP NAPT traversal package to enable the recording of discarded packets due to implicit filtering by the latching function.
Traffic policing statistics [ITU-T H.248.53]	tmanr	2	Complements the traffic management package, allowing the recording of the number of packets and octets that did not conform to the traffic parameters, and the number of packets that were dropped due to such violations.
RSVP extension package [ITU-T H.248.65]	rsvp	1	Support of resource reservation protocol (RSVP) based on Pull mode resource control.

6.13.2 Package usage information

6.13.2.1 Generic (g)

Table 6-72 – 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)	M	ADD, NOTIFY		
	Event parameters	Mandatory/ Optional	Supported values	Provisioned value
	None.			
	ObservedEvent parameters	Mandatory/ Optional	Supported values	Provisioned value
	General cause (Generalcause)	M	All	Not applicable
	Failure cause (Failurecause)	M	All	Not applicable
Statistics	Mandatory/ Optional	Used in command	Supported values	
None				
Error codes	Mandatory/Optional			
None				

6.13.2.2 Base root (root)

Table 6-73 – Base root package

Properties	Mandatory/ Optional	Used in command	Supported values	Provisioned value
MaxNrOfContexts (root/maxNumber OfContexts)	O	AUDITVALUE	All	Yes
MaxTerminationsPerContext (root/maxTermination PerContext)	O	AUDITVALUE	All	Yes