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ETSI Standard

**Telecommunications and Internet converged Services and
Protocols for Advanced Networking (TISPAN);
Resource and Admission Control: H.248 Profile for controlling
Border Gateway Functions (BGF) in the Resource and
Admission Control Subsystem (RACS);
Protocol specification**



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Foreword

This ETSI Standard (ES) has been produced by ETSI Technical Committee Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN).

1 Scope

The present document defines a profile of the Gateway Control Protocol (H.248.1) to be used for controlling Border Gateway Functions (BGF), as defined in ES 282 003 [3].

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 and/or edition number or version number) or non-specific.
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NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

- [1] ITU-T Recommendation H.248.1 (2005): "Gateway control protocol: Version 3".
- [2] ETSI TS 102 333: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Gate control protocol".
- [3] ETSI ES 282 003: "Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Resource and Admission Control Sub-system (RACS); Functional Architecture".
- [4] ITU-T Recommendation H.248.45: "Gateway control protocol: MGC information package".
- [5] ITU-T Recommendation H.460.18: "Traversal of H.323 signalling across network address translators and firewalls".
- [6] IETF RFC 4234: "Augmented BNF for Syntax Specifications: ABNF".
- [7] IETF RFC 3264: "An Offer/Answer Model with Session Description Protocol (SDP)".
- [8] IETF RFC 2663: "IP Network Address Translator (NAT) Terminology and Considerations".
- [9] ITU-T Recommendation H.248.37: "Gateway control protocol: IP NAPT traversal package".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

BGF: packet-to-packet gateway for user plane media traffic

NOTE 1: The BGF performs both policy enforcement functions and NA(P)T functions under the control of the SPDF.

NOTE 2: A Border Gateway Function (BGF) provides the interface between two IP-transport domains. It may reside at the boundary between an access network and a core network or between two core networks, as defined in ITU-T Recommendation H.248.45 [4]. The BGF has the "H.248 MG" role in the scope of the present document.

GATE: represents a transport plane function enabling or disabling the unidirectional forwarding of IP packets under specified conditions (e.g. QoS)

NOTE: See TS 102 333 [2].

PINHOLE: configuration of two associated H.248 IP Terminations within the same H.248 Context, which allows/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 Recommendation H.248.37 [9].

Resource and Admission Control Subsystem (RACS): provides admission control and gate control functionalities

NOTE: Including the control of NAPT and priority marking.

Service Policy Decision Function (SPDF): logical policy decision element for service-based policy control (SBP)

NOTE: The SPDF makes policy decisions using policy rules for Service Based Policy Control (SBP). The SPDF has the "H.248 MGC" role in the scope of the present document.

3.2 Abbreviations

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

ABNF	Augmented Backus-Naur Form
AF	Application Function
BGF	Border Gateway Function
BGW	Border GateWay
C-BGF	Core-BGF
DSCP	Differentiated Services Code Point
GCP	Gate Control Protocol
HW	HardWare
I-BGF	Interconnect-BGF
IP	Internet Protocol
IPSec	IP Security
LD	Local Descriptor (H.248)
MG	Media Gateway
MGC	Media Gateway Controller
MPLS	Multi Protocol Label Switching
NA	Not Applicable
NAPT	Network Address and Port Translation
NAPT-PT	NAPT and Protocol Translation
NAT	Network Address Translation

QoS	Quality of Service
RACS	Resource and Admission Control Subsystem
RD	Remote Descriptor (H.248)
RFC	Request For Comments (IETF)
RTCP	RTP Control Protocol
RTP	Real-time Transport Protocol
RTSP	Real Time Streaming Protocol
SCTP	Stream Control Transport Protocol
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SPDF	Service Policy Decision Function
TCP	Transmission Control Protocol
TISPAN	Telecommunications and Internet converged; Services and Protocols for Advanced Networking
UDP	User Datagram Protocol
VLAN	Virtual LAN

NOTE: It has to be noted that there is also a different definition for "pinhole", which is used in the context of H.323 systems (see ITU-T Recommendation H.460.18 [5]). The difference is the fact that the "H.248 pinhole" and "gate" are unidirectional, whereas the "H.323 pinhole" is bidirectional.

4 Applicability

4.1 Architecture

The present document defines an H.248 Profile for the reference point between the Service Policy Decision Function (SPDF) and the Border Gateway Function (BGF), known as the Ia reference point. The SPDF interacts with the BGF to request services. This reference point is used for communication between the SPDF and a Core Border Gateway Function (C-BGF) and between the SPDF and an Interconnect Border Gateway Function (I-BGF).

Specific requirements for this reference point are described in ES 282 003 [3] "NGN Release 1: Functional Architecture; Resource and Admission Control Sub-system (RACS)" specification. Figure 1 illustrates the architecture assumed in the present document.

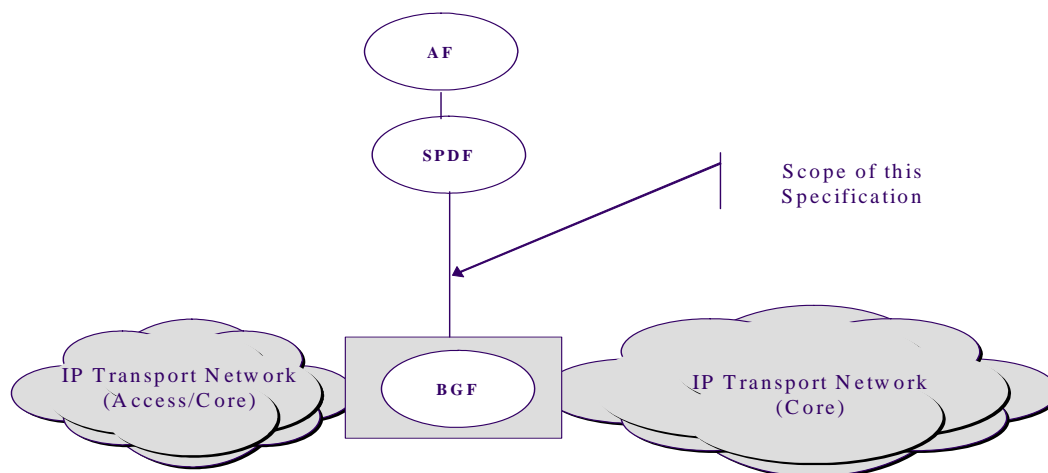


Figure 1: Reference architecture

5 Profile description

5.1 Profile Identification

Table 1: Profile Identification

Profile name	ETSI_BGF
Version:	1

5.2 Summary

The present document supports the control of the following functionality in IP-to-IP Media Gateways:

- opening and closing gates (i.e. packets filtering depending on "IP address/port");
- allocation and translation of IP addresses and port numbers (NAPT);
- interworking between IPv4 and IPv6 networks (NAPT-PT);
- hosted NAT traversal;
- packet marking for outgoing traffic;
- resource allocation and bandwidth reservation;
- policing of incoming traffic; and
- usage metering.

5.3 Gateway Control Protocol Version

ITU-T Recommendation H.248.1 Version 3 [1].

NOTE: Version 3 of the H.248 protocol is needed, due to the possible usage of stream statistics.

5.4 Connection model

Table 2: Connection Model

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

5.5 Context attributes

Table 3: Context Attributes

Context Attribute	Supported	Values Supported
Topology	No	NA
Priority Indicator	Yes	0 to15
Emergency Indicator	Yes	ON/OFF
IEPS Indicator	No	NA
ContextAttribute Descriptor	No	NA
ContextIdList Parameter	No	NA
AND/OR Context Attribute	No	NA

5.6 Terminations

5.6.1 Termination names

5.6.1.1 IP Termination

5.6.1.1.1 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 4.

Table 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 to 255)	No	Yes
Interface	Logical or physical interface to a network to/from which the termination will be sending/receiving media. (See notes 1 and 2).	String of max 51 alphanumeric characters	No	Yes
Id	Termination specific identifier (See note 3).	Non-zero 32 bit integer	Yes	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: A specific address space may be associated with each interface or group of interfaces. In such cases, by specifying a partially wildcarded Termination ID in an ADD command, the SPDF has the ability to choose the address space in which the BGF will allocate an IP address for the termination (e.g. ip/<group>/<interface>/\$).

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

There are two potential relationships between <group> and <interface> within the TerminationID structure:

- **strictly hierarchical:** a single "interface" is completely associated to a dedicated "group".

EXAMPLE 1: 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 HW failures that may lead to issuing a single ServiceChange command rather than multiple ServiceChange commands.

- **partially hierarchical:** an "interface" is distributed over multiple "groups".

EXAMPLE 2: 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 allocate an adequate number of terminations within a <group>. Therefore Audits could be paced for example: ip/1/*, ip/2/*, ..., ip/n/*.

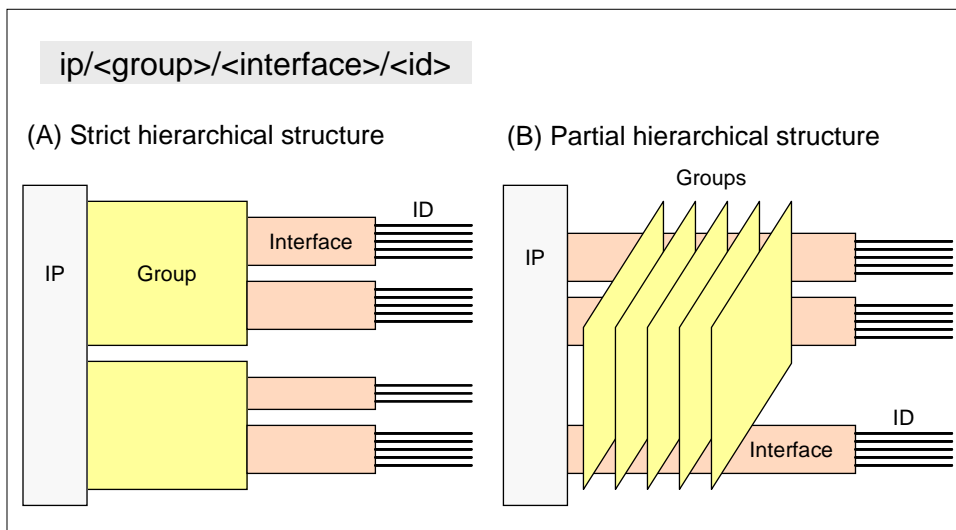


Figure 2: Group/Interface relationships for the structure of terminationIDs
Potential use cases

The following examples depict the advantages that each group/interface relationship may facilitate.

Table 5: Group/interface Relationship

Semantic of Termination Name	ServiceChange Command (e.g. due to a HW Failure)	AuditValue Command (e.g. Requesting a list of Context IDs present in the MG where $n \ll N$)
Strictly hierarchical	<p>Upon a HW failure the command issued is (by MG):</p> <pre>ServiceChange=ip/1/*{Services{ Method=Restart,Reason="906" Version=3,Profile = ETSI_BGF_1/1}},</pre> <p>a single wildcarded command is possible (facilitated by a strict hierarchical relationship).</p>	<p>The command (from MGC):</p> <pre>Context={AuditValue=Root{Audit{}}}</pre> <p>Returns:</p> <pre>Context=1{AuditValue=ip/1/11},AuditValue=ip/1/12}}, Context=2{AuditValue=ip/1/21},AuditValue=ip/1/22}}, Context=3{AuditValue=ip/1/31},AuditValue=ip/1/32}}, ... Context=N{AuditValue=ip/x/11},AuditValue=ip/x/12}}</pre> <p>... if there is no "control" of the number of terminations allocated per group, this could potentially return very large Audit Reply responses.</p>
Partially hierarchical	<p>Upon a HW failure the command issued is (by MG):</p> <pre>ServiceChange=ip/*/1{Services{ Method=Restart,Reason="906", Version=3,Profile = ETSI_BGF_1/1}}, ServiceChange=ip/*/2{Services{ Method=Restart,Reason="906", Version=3,Profile = ETSI_BGF_1/1}}, ... ServiceChange=ip/*/x{Services{ Method=Restart,Reason="906", Version=3,Profile = ETSI_BGF_1/1}}</pre> <p>... a single wildcarded command is not always possible when not using a strict hierarchical relationship</p>	<p>The command (by MGC):</p> <pre>Context={AuditValue=ip/1/*{Audit{}}}</pre> <p>Returns:</p> <pre>Context=1{AuditValue=ip/1/11},AuditValue=ip/1/12}}, ... Context=n{AuditValue=ip/1/1n},AuditValue=ip/1/2n}}</pre> <p>... and this command would be repeated for each group. (facilitated by loose hierarchical relationship)</p>

5.6.1.1.2 Syntactical Specification

5.6.1.1.2.1 ABNF Grammar for H.248 Text Encoding Mode

ABNF (RFC 4234 [6]) is used for the syntax specification. The ABNF for TerminationID and relation to pathNAME is defined in annex B.2/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         = %d0-255                             ; data type: INT8
Interface     = 1*51ALPHANUM
Identifier    = %d1-4294967295                       ; data type: INT32
ALPHANUM      = ALPHA / DIGIT
WildcardCHOOSE = "$"
WildcardALL   = "*"

```

5.6.2 Multiplexed terminations

Table 6: Multiplexed Terminations

MultiplexTerminations Supported?	No
----------------------------------	----

5.7 Descriptors

5.7.1 TerminationState Descriptor

Table 7: ServiceState Property

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

NOTE: All H.248 Terminations have a ServiceState property according to H.248.1, but explicit usage of the TerminationState Descriptor ServiceState property is not required by the present document. ServiceState changes can still occur, however, and be indicated in ServiceChange Commands.

Table 8: EventBufferControl Property

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

5.7.2 Stream Descriptor

Table 9: Stream Descriptor

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

Table 10: Stream Configuration

Stream Configuration:	ALL configurations are allowed
-----------------------	--------------------------------

5.7.2.1 LocalControl Descriptor

Table 11: LocalControl Descriptor

If not generic list appropriate termination and stream types		Termination Type	Stream Type
ReserveGroup used:	No		
ReserveValue used:	No		

Table 12: Termination Type

Termination Type	Stream Type	Allowed StreamMode Values
IP	ALL	SendOnly, RecvOnly, SendRecv, Inactive

5.7.3 Events descriptor

Table 13: Events Descriptor

Events settable on termination types and stream types:	Yes		
If yes	Event ID	Termination Type	Stream Type
	See clause 5.14.2.1	ALL except ROOT	ANY
	See clause 5.14.2.3	ALL except ROOT	ANY

Table 14: EventBuffer Control

EventBuffer Control used:	No
---------------------------	----

Table 15: KeepActive

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

Table 16: Embedded Events and Signals

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

Table 17: Regulated Embedded Events

Regulated Embedded events are triggered on:	None
---	------

Table 18: ResetEventsDescriptor

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

Table 19: NotifyImmediate, NotifyRegulated and NeverNotify

NotifyImmediate	ALL Events
NotifyRegulated:	None
NeverNotify:	None

5.7.4 EventBuffer descriptor

Table 20: EventBuffer Descriptor

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

5.7.5 Signals descriptor

Table 21: Signals Descriptor

Signals settable dependant on termination or streams types	Yes		
If yes	Signal ID	Termination Type	Stream Type/ID
	ipnapt/*	ALL except ROOT	ANY

Table 22: Signals Lists

Signals Lists supported:	No
--------------------------	----

Table 23: Signals Type and Duration

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

Table 24: Signals Direction

Signal Direction supported:	No
-----------------------------	----

Table 25: NotifyCompletion and RequestID

NotifyCompletion supported	No
RequestID Parameter Supported:	No

Table 26: Simultaneously Played Signals

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

Table 27: KeepActive

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

5.7.6 DigitMap descriptor

Table 28: DigitMap Descriptor

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

5.7.7 Statistics descriptor

Table 29: Statistics Descriptor

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

Table 30: Statistics Reported On Substract

Statistics reported on Substract	Yes	
If yes	Statistic IDs reported:	ALL (See clause 5.14. for details)

5.7.8 ObservedEvents descriptor

Table 31: ObservedEvents Descriptor

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

5.7.9 Topology descriptor

Table 32: Topology Descriptor

Allowed triples:	NA
------------------	----

5.7.10 Error descriptor

Table 33: Error Codes sent by MGC

Supported H.248.8 Error Codes:	ALL
Supported Error Codes defined in packages:	All error codes defined in supported packages need to be supported

Table 34: Error Codes sent by MG

Supported 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.

5.8 Command API

Table 35 shows in which direction commands are sent, which terminations they can be associated with, and which wildcard options are supported for the specific command.

Table 35: Commands and Terminations

Command	Sent By	Used on Termination Type		Wildcard Support	
		IP	ROOT	W-	O-
Add	SPDF	Yes	No	No	No
AuditCapabilities	-	-	-	-	-
AuditValue	SPDF	Yes	Yes	No	Yes
Modify	SPDF	Yes	Yes	No	No
Notify	BGF	Yes	No	No	No
ServiceChange	BGF	Yes	Yes	No	No
Subtract	SPDF	Yes	No	Yes	No

Tables 36 and 37 show for which termination types a specific descriptor can be applied, and with which commands and replies the descriptor can be used.

Table 36: Descriptors and Requests

Descriptor type	Termination type		Request					
	Root	IP	Add	Audit Value	Modify	Notify	Service Change	Subtract
Audit		Yes		Yes	Yes			Yes
Error								
Events	Yes	Yes	Yes	Yes	Yes			
Local		Yes	Yes		Yes			
LocalControl		Yes	Yes		Yes			
Media	Yes	Yes	Yes		Yes			Yes
ObservedEvents		Yes				Yes		
Packages	Yes			Yes				
Remote		Yes	Yes		Yes			
ServiceChange	Yes	Yes					Yes	
Signals		Yes	Yes		Yes			
Statistics		Yes		Yes	Yes			Yes
Stream		Yes	Yes		Yes			Yes
TerminationState	Yes				Yes			

Table 37: Descriptors and Replies

Descriptor type	Termination type		Reply					
	Root	IP	Add	Audit Value	Modify	Notify	Service Change	Subtract
Audit		Yes		Yes	Yes			Yes
Error	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Events								
Local		Yes	Yes		Yes			
LocalControl								
Media	Yes	Yes	Yes		Yes			
ObservedEvents								
Packages				Yes				
Remote								
ServiceChange	Yes	Yes					Yes	
Signals								
Statistics		Yes			Yes			Yes
Stream		Yes	Yes		Yes			Yes
TerminationState	Yes							

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 tables.

5.8.1 Add

Table 38: Descriptors used by Add Request

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

Table 39: Descriptors used by Add Reply

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

5.8.2 Modify

Table 40: Descriptors used by Modify Request

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

Table 41: Descriptors used by Modify Reply

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

5.8.3 Subtract

Table 42: Descriptors used by Subtract Request

Descriptors used by Subtract request:	Audit (Media (Stream ((Statistics))))
---------------------------------------	---------------------------------------

Table 43: Descriptors used by Subtract Reply

Descriptors used by Subtract reply:	Statistics
-------------------------------------	------------

5.8.4 Move

Table 44: Descriptors used by Move Command

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

5.8.5 AuditValue

Table 45: Descriptors used by AuditValue Command

Audited Properties:	None
Audited Statistics:	ALL
Audited Signals:	None
Audited Events:	ALL
Packages Audit possible:	Yes

5.8.6 AuditCapabilities

Table 46: Descriptors used by AuditCapabilities Command

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

5.8.7 Notify

Table 47: Descriptors used by Notify Command

Descriptors used by Notify Request: Descriptors used by Notify Reply:	ObservedEvents
--	----------------

5.8.8 ServiceChange

Table 48: ServiceChangeMethods and ServiceChangeReasons sent by MGC

Service Change Methods Supported:
None

Table 49: ServiceChangeMethods and ServiceChangeReasons sent by MG

Service Change Methods Supported:	ServiceChange Reasons supported:
Disconnected	900
Forced	904, 905, 906, 915
Restart	901, 902

Table 50: ServiceChangeAddress

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

Table 51: ServiceChangeDelay

ServiceChangeDelay used:	No
--------------------------	----

Table 52: ServiceChange Incomplete Flag

ServiceChange Incomplete Flag used:	No
-------------------------------------	----

Table 53: ServiceChangeVersion

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

Table 54: Profile Negotiation

Profile negotiation as per H.248.18:	No
--------------------------------------	----

5.8.9 Manipulating and auditing context attributes

Table 55: Context Attributes Manipulation and Auditing

Context Attributes Manipulated:	Emergency, Priority
Context Attributes Audited:	None

5.9 Generic command syntax and encoding

Table 56: Command Encoding

Supported Encodings:	Text (see notes 1 and 2)
NOTE 1: The receiver shall be capable of receiving both Short Token Notation and Long Token Notation on an H.248 association.	
NOTE 2: The transmitter may select between long and short token forms per H.248 association.	

5.10 Transactions

Table 57: Maximum number of Transaction Requests/Replies/TransResponseAcks/Segment

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

Table 58: Maximum number of Commands per Transaction Request

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

Table 59: Maximum number of Commands per Transaction Reply

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

Table 60: Optional Commands

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

Table 61: Wildcarded Commands

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

Table 62: Transaction Timer

Transaction Timer:	Value
normalMGExecutionTime	Provisioned
normalMGCExecutionTime	Provisioned
MGOriGINatedPendingLimit	Provisioned
MGCOrIginatedPendingLimit	Provisioned
MGProvisionalResponseTimerValue	Provisioned
MGCProvisionalResponseTimerValue	Provisioned

5.11 Messages

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

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

5.12 Transport

Table 63: Transport

Supported Transports:	SCTP (Recommended) UDP (Optional)
-----------------------	--------------------------------------

Table 64: Segmentation

Segmentation Supported:	SCTP: Inherent in Transport UDP: Optional (dependent on support of Segmentation Package, see clause 5.14.2.12)
-------------------------	---

Table 65: 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 66: Security

Supported Security:	None
---------------------	------

5.14 Packages

5.14.1 Overview

Table 67: Mandatory Packages

Mandatory Packages		
Package Name	Package ID	Version
Generic	g	2
Base root	root	2
Network	nt	1
Diffserv	ds	1
Gate management	gm	1
Traffic management	tman	1
IP NAPT traversal	ipnapt	1

Table 68: Optional Packages

Optional Packages			
Package Name	Package ID	Version	Support dependent on
MPLS	mpls	1	Support of MPLS label stacks.
VLAN	vlan	1	Support of VLAN tags.
MGC Information	mgcinfo	1	Support of MGC related recovery.
Inactivity	it	1	Only applicable for UDP transport
Segmentation	seg	1	Applicable for UDP transport where sufficiently large messages are required to be supported.

5.14.2 Package usage information

5.14.2.1 Generic (g)

Table 69: 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, MODIFY, 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				

5.14.2.2 Base root (root)

Table 70: Base root package

Properties	Mandatory/ Optional	Used in command	Supported Values	Provisioned Value
root/maxNumberOfContexts	O	AUDITVALUE	ALL	YES
root/maxTerminationPerContext	O	AUDITVALUE	ALL	YES
root/ normalMGExecutionTime	O	MODIFY, AUDITVALUE	ALL	YES
root/ normalMGCExecutionTime	O	MODIFY, AUDITVALUE	ALL	YES
root/ MGProvisionalResponseTimerValue	O	MODIFY, AUDITVALUE	ALL	YES
root/ MGCProvisionalResponseTimerValue	O	MODIFY, AUDITVALUE	ALL	YES
root/ MGCOrientedPendingLimit	O	MODIFY, AUDITVALUE	ALL	YES
root/ MGOrientedPendingLimit	O	MODIFY, 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				

5.14.2.3 Network (nt)

Table 71: Network package

Properties	Mandatory/ Optional	Used in command	Supported Values	Provisioned Value
Maximum jitter buffer (nt/jit)	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:		
Network failure (nt/netfail)	O	ADD, MODIFY, NOTIFY		
	Event Parameters	Mandatory/ Optional	Supported Values:	Provisioned Value:
	<name and Identity>	<M/O>	<Values/ALL>	<Value/Not Applicable>
	ObservedEvent Parameters	Mandatory/ Optional	Supported Values:	Provisioned Value:
	<name and Identity>	<M/O>	<Values/ALL>	<Value/Not Applicable>
Quality alert (nt/qualert)	O	ADD, MODIFY, NOTIFY		
	Event Parameters	Mandatory/ Optional	Supported Values:	Provisioned Value:
	Threshold (th)	O	ALL	Not Applicable
	ObservedEvent Parameters	Mandatory/ Optional	Supported Values:	Provisioned Value:
	Threshold (th)	O	ALL	Not Applicable
Statistics	Mandatory/ Optional	Used in command:	Supported Values:	
Duration (nt/dur)	O	SUBTRACT	ALL	
Octets sent (nt/os)	M	SUBTRACT	ALL	
Octets received (nt/or)	M	SUBTRACT	ALL	
Error Codes	Mandatory/Optional			
None				

5.14.2.4 Differentiated Services (DS)

Table 72: Differentiated Services package

Properties	Mandatory/Optional	Used in command	Supported Values	Provisioned Value
ALL	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				

5.14.2.5 Gate Management (GM)

Table 73: Gate Management Package

Properties	Mandatory/Optional	Used in command	Supported Values	Provisioned Value
ALL	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:	
Discarded Packets gm/dp	O	Subtract	ALL	
Error Codes	Mandatory/Optional			
None				

5.14.2.6 Traffic management (tman)

Table 74: Traffic Management Package

Properties	Mandatory/ Optional	Used in command	Supported Values	Provisioned Value
ALL	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				

5.14.2.7 IP NAPT Traversal (ipnapt)

Table 75: IP NAPT Traversal Package

Properties	Mandatory/ Optional	Used in command	Supported Values	Provisioned Value
None				
Signals	Mandatory/ Optional	Used in command:		Duration Provisioned Value:
Latching (ipnapt/latch)	M	ADD, MODIFY		Not Applicable
	Signal Parameters	Mandatory/ Optional	Supported Values:	Duration Provisioned Value:
	NAPT Traversal Processing (napt)	M	ALL	Not Applicable
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				

5.14.2.8 MPLS (mpls)

Table 76: MPLS Package

Properties	Mandatory/ Optional	Used in command	Supported Values	Provisioned Value
ALL	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:	
None				
Error Codes	Mandatory/Optional			
None				

5.14.2.9 VLAN (vlan)

Table 77: VLAN Package

Properties	Mandatory/ Optional	Used in command	Supported Values	Provisioned Value
ALL	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:	
None				
Error Codes	Mandatory/Optional			
None				

5.14.2.10 MGC Information (mgcinfo)

Table 78: MGC Information Package

Properties	Mandatory/ Optional	Used in command	Supported Values	Provisioned Value
ALL	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				

5.14.2.11 Inactivity (it)

Table 79: Inactivity 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 (ito)	M	MODIFY, NOTIFY		
	Event Parameters	Mandatory/ Optional	Supported Values:	Provisioned Value:
	Maximum Inactivity Time (mit)	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				

5.14.2.12 Segmentation (seg)

Table 80: Segmentation Package

Properties	Mandatory/ Optional	Used in command	Supported Values	Provisioned Value
MGSegmentation TimerValue	M	NOTIFY	ALL	YES
MGCSegmentation TimerValue	M	NOTIFY	ALL	YES
MGMaxPDUSize	M	NOTIFY	ALL	YES
MGCMaxPDUSize	M	NOTIFY	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			
459	M			

5.15 Mandatory support of SDP and annex C information elements

Table 81: Supported SDP Information Elements

SDP Information Element	Mandatory/optional	Description
Protocol version "v=" line	Mandatory	The value must always be equal to zero: v=0
Connection "c=" line	Mandatory	The <i>network type</i> must always be "IN". The <i>address type</i> value must be "IP4" or "IP6". The <i>connection address</i> value may be underspecified with CHOOSE wildcard ("\$").
Media "m=" line	Mandatory	"-" may be used for the <i>media</i> value. Other values shall be ignored, unless media specific information is required. The <i>port</i> value may be underspecified with CHOOSE wildcard ("\$"). "-" may be used for the transport value, unless transport specific behaviour is required by the MG. (See note) "-" may be used for the <i>format list</i> value. Other values shall be ignored.
Bandwidth "b=" line	Mandatory NOTE: MUST be used together with a "m=" line.	The <i>modifier</i> value must always be "AS". The <i>bandwidth-value</i> value defines the required protocol layer 2 (e.g. Ethernet) 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 <i>bandwidth</i> value will include the bandwidth used by RTP and RTCP together.
NOTE: Even if the transport value is RTP, the "RTP Specific Behaviour" property of the Gate Management package (gm) shall be used to indicate whether RTCP resource reservation is also requested.		

5.16 Optional support of SDP and annex C information elements

None.

5.17 Procedures

5.17.1 General procedures

5.17.1.1 Gate control

The realization of a gate requires two ephemeral terminations. An ephemeral termination sources and/or sinks one or more media streams. Gates are direction and stream dependent.

By default, terminations representing gates for RTP traffic will typically require two UDP streams per media (one for RTP packets, one for RTCP packets). Hence, monomedia sessions require two bidirectional media streams, while a multi-media session with voice and video traffic would require four media streams, sourced and/or sinked by the same termination.

However, RTP traffic may also be controlled through a single H.248 stream, representing both the RTP and RTCP flows, if the RTP Specific Behaviour property of the Gate Management package is set to ON. In such a case, when the MG is requested to allocate a port for an RTP flow, a consecutive port for the associated RTCP flow is automatically allocated.

The H.248 base protocol enables the MGC to choose the IP address and port on which a termination will receive media flows. In addition, the Gate Management package enables the MGC to explicitly provide the following information:

- expected IP source address and port of received packets;
- IP source address and port of sent packets.

The relationship between H.248 descriptors in the present document and the addresses used in packets sent and received by the gate is indicated in table 81.

Table 82: Relation between Packet Direction, IP Address/Port and H.248 Descriptor/Information

Packet direction	IP Address/Port	H.248 Descriptor or Information
Received by termination	Source	1. LocalControl Descriptor/gate management/remote source address mask + remote source port range or, if not present: 2. Source address not explicitly enforced/signalled via "gm" package
Received by termination	Destination	Local Descriptor
Sent by termination	Source	1. LocalControl Descriptor/gate management/local source address + local source port or, if not present: 2. Source address not explicitly enforced/signalled via "gm" package
Sent by termination	Destination	Remote Descriptor

Opening and closing gates is achieved by setting the Stream mode parameter of the associated termination(s) to the appropriate values. Subtracting a termination from a context also closes the gate for all H.248 streams in the termination.

In the context of conversational services, an active session requires that both the upstream and downstream gate be opened in bi-directional mode.

Filtering on the IP source address and/or port might be implemented using the Gate Management package, or using the SDP information in the Remote Descriptor. In case the filtering is done based on the Remote Descriptor, the activation/deactivation of the filtering is configured in the MG. If the Gate Management package is used, it shall override the configured value in the MG.

NOTE: It should be noticed that the IP source address and port may not always be available to the MGC. When SIP signalling is used, the session description does not contain this information (i.e. according to RFC 3264 [7], the IP address and port present in an SDP offer indicate nothing about the source IP address and source port of RTP and RTCP packets that will be sent by the offerer). Any other protocol that uses SDP as a session description mechanism (e.g. RTSP) has the same constraints.

In such configurations, the Gate Management Package may be used as follows:

- in an IPv6 environment, the Source Address Mask property contains the 64 bits prefix of the IP address that is set in the termination's Remote Descriptor;
- in an IPv4 environment, the Source Address Mask property contains the IP address that is set in the termination's Remote Descriptor, except that a number of trailing digits may be wildcarded;
- in both cases, Source Port Filtering should not be activated.

The gate concept, together with H.248 Stream/Termination handling, is further illustrated in annex A.

5.17.1.2 Allocation and translation of IP addresses, ports and versions (NAPT-PT)

The procedures of this clause support the following NAPT-PT functionality:

- NAPT-PT functionality with "double" addresses and ports translation (both source and destination addresses and ports are translated);
- or optional NAPT-PT functionality with "single" address and port translation (either source or destination address and port translation) - applicable if the BGF has router functionality, or direct L2 connectivity with user terminals.

The H.248 base protocol enables the MGC to either choose the addresses and ports associated with a termination or to request the MG to allocate these IP addresses and ports. NAPT control on destination addresses and ports is achieved by setting the Local and Remote Descriptors according to the following principles:

- The IP and port address in the Remote Descriptors are set by the MGC according to the information received in call/session signalling (e.g. SDP in SIP INVITE and 200 OK).
- The address and port in the Local Descriptor are selected by the MG within the indicated IP address realm from MGC side (see also below).

If the BGF has router functionality, or direct L2 connectivity with the user terminals, the addressee and port of the Local Descriptor towards the private network may optionally be set according to the following principles:

- The IP and port address in the Local Descriptor towards the private network is provided by the MGC (instead of being selected by the MG). The MGC shall copy the Remote Descriptor of the public network into the Local Descriptor towards the private network.

The MGC has the ability to choose the address space in which the MG allocates an IP address. This is achieved by setting the "interface" field of the IP termination identifier to the appropriate value (see clause 5.6.1.1). The association of dedicated "IP address spaces" (also known as "IP address realms" or briefly "IP realms", see RFC 2663 [8]) with IP termination field "interface" requires a mutual agreement between MGC and MG. This is realized via provisioning, thus beyond the scope of the present document.

Figure 3 provides an example of "double" network address and port translation, where a session is to be established between IPv4 addresses 10.140.120.10 (private address) and 156.106.192.33 (public address).

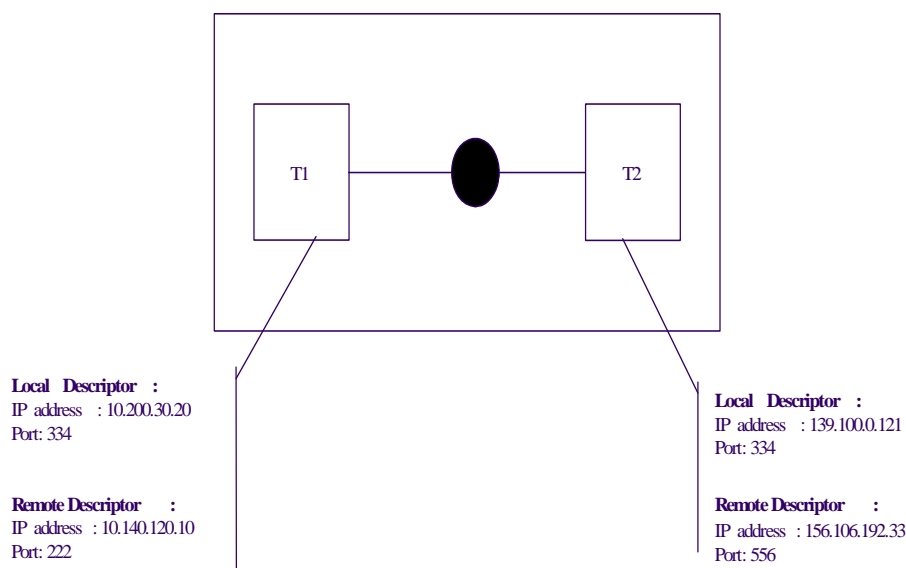


Figure 3: Network Address and Port Translation (NAPT)

For "single" network address and port translation applications, the T1 Local Descriptor address and port in figure 3 has to be changed to 156.106.192.33: 556 (equal to the T2 Remote Descriptor address and port).

NAPT control on source addresses and ports is achieved by setting the local source address and local source port properties defined in the Gate Management package to a value that differs from the actual source address of the packets received from the remote entity.

Protocol Translation (NAPT-PT) can be controlled by the MGC by adding to the same H.248 context, two terminations whose media descriptors have different address-type values in the "c=" line.

5.17.1.3 Support of Hosted NAT Traversal

"Hosted NAT Traversal" relates to "assisting remote NAT/NAPT traversal" for the remote (peer) IP connection endpoints from BGF/SPDF point of view. This relates to an interim NA(P)T device from BGW perspective. The remote IP address information cannot be retrieved from the Remote Descriptor. The "Hosted NAT Traversal" function is controlled by the MGC using the IP NAPT Traversal package (ipnapt). Using the napt package, the MG is requested to perform media latching, i.e. listen for incoming media and latch to the remote address information of that media.

5.17.1.4 QoS marking

The Differentiated Services package enables the MGC to control the setting of the DSCP value for all packets leaving the MG.

5.17.1.5 Bandwidth control

Resources are reserved independently on upstream and downstream gates. For each gate, reservation of local resources for handling incoming and outgoing traffic is achieved by setting the appropriate properties in the Local and Remote Descriptors. Only one session description shall be included in each Stream Descriptor. Hence, the ReserveValue and ReserveGroup properties should not be used and are ignored by the MG.

The amount of required bandwidth for sending packets is expressed using the "b=" line of the SDP description contained in the Remote Descriptors.

The amount of required bandwidth for sending packets is expressed using the "b=" line of SDP description contained in the Local Descriptors or using the properties of the traffic management package. The Traffic Management package (tman) should be used in case of variable bit rate traffic.

Policing of incoming traffic can be enabled using the Traffic Management package. Policing on incoming traffic can be set independently for each gate.

The properties of the Traffic Management package shall be set to values that are compatible with the "b=" line value of the local descriptor.

If no bandwidth information is provided, the MG will not perform traffic policing, and may not allocate enough bandwidth for all types of traffic.

5.17.1.6 Usage metering and statistics reporting

Usage metering is supported by the statistics defined in the network package. Such statistics are notified to MGC when a termination is subtracted from a context (e.g. at the end of a session). They provide information about the duration of the time a termination has been in a context, the number of octets sent and received. The "number of octets" excludes all transport overhead (see clause E.11.4/H.248.1 Version 3), i.e. IP header and transport protocol (e.g. TCP, UDP) header information is excluded.

RTP statistics is out of the scope of this version 1 of the Profile.

The number of discarded packets due to source filtering may be reported on basis of the gm/dp statistic.

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

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

A.1 General

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/H.248.1. 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).

It has to be noted that 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.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 [1]). Media flows are interconnected by using the same StreamID (here: StreamID equals to S1 for T1 and T2).

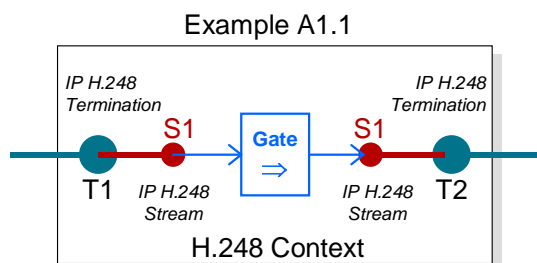


Figure A.1: H.248 Context - Illustration of Gate, Stream and Terminations

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 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.

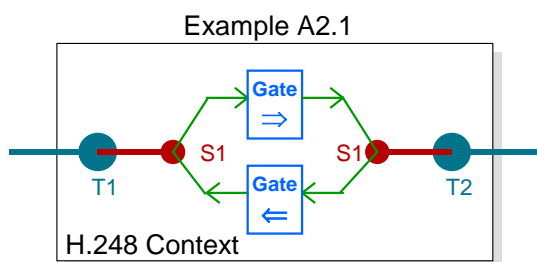


Figure A.2: H.248 Context Bidirectional Session using single H.248 Streams

Annex B (informative): Comparison with TS 102 333 (GCP)

B.1 General

The H.248 Profile defined in the present document supports similar functionality to the Gate Control Profile defined in TS 102 333 [2]; however, it is important to note that the "H.248 Profile for the Ia Interface" is a new profile. This annex provides an overview of the main differences between them.

B.2 Differences between TS 102 333 (GCP) and ES 283 018 (Ia Profile)

Table B.1 provides an overview of the differences between the Gate Control Protocol and the H.248 Profile for the Ia Interface.

Table B.1: Difference Between TS 102 333 [2] and the present document

Topic	TS 102 333 [2] (Gate Control Protocol)	ES 283 018 (Ia Profile)
Required H.248 Version	H.248 Version 2	H.248 Version 3
QoS monitoring	Supported	Not Supported
Supported with "latching" capability only	Hosted NAT traversal	Supported with "relatching" capabilities
Connection Model (see note)	a gate is represented by an ephemeral termination. Hence, a bidirectional active session requires two open gates (one at each side of the border gateway).	a gate is represented by a pair of ephemeral terminations (one at each side of the border gateway). A bidirectional active session requires two gates (one per direction) sharing the same pair of terminations.
Termination ID structure	ip/<interface>/<id>	ip/<group>/<interface>/<id>
Transport	mandates the support of SCTP, TCP or UDP	Recommends SCTP, UDP as optional
Encoding	Text and Binary	Text
SDP Usage (s=, t=)	Specifies how the s= and t= lines should be set	Provides no guidance on this
Security	IPSec as an option	Does not assume a security mechanism
TimeStamps in ServiceChange and Notify commands	Required	Not required
Transaction Timers	Shall be in a range between 100 ms and 5 s	No range specified
Packages		
Generic Package	Version 1	Version 2
Root Package	Version 1	Version 2
NAT traversal package	Supported	Not Supported
IP NAPT traversal package	Not Supported	Supported
Congestion Handling package	Supported	Not Supported
Quality Alert Ceasing	Optional	Not Supported
Overload Control	Optional	Not Supported
EMP Package	Optional	Not Supported
Gate Recovery Information	Supported	Not Supported
MGC Information Package	Not Supported	Optional
Segmentation Package	Not Applicable	Optional
NOTE: This difference in modelling does not have any impact on the external behaviour of the border gateway.		

Annex C (informative): Bibliography

ITU-T Recommendation H.248.4 (2000): "Gateway control protocol: Transport over Stream Control Transmission Protocol (SCTP)".

IETF RFC 2327: "SDP: Session Description Protocol".

History

Document history		
V1.1.1	June 2006	Publication
V1.1.4	August 2007	Membership Approval Procedure MV 20071005: 2007-08-07 to 2007-10-05
V1.1.4	October 2007	Publication