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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Communication procedures

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Gateway control protocol: RTP control protocol package

Recommendation ITU-T H.248.57

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Recommendation ITU-T H.248.57

Gateway control protocol: RTP control protocol package

Summary

Recommendation ITU-T H.248.57 defines an ITU-T H.248 package for ephemeral terminations with real-time transport protocol-based streams and allows the media gateway controller to control the *handling* of real-time transport protocol control protocol (RTCP) traffic within the ITU-T H.248 stream. RTCP handling comprises functions such as the indication of whether an RTCP flow is used, resource management functions for specific RTCP resources and the allocation scheme of transport port values.

This revision contains a clarification to the RTCP handling package description to make it clear that it applies to multiple flows.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T H.248.57	2008-06-13	16
2.0	ITU-T H.248.57	2013-03-16	16

FOREWORD

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Gateway control protocol: RTP control protocol package

1 Scope

This Recommendation contains functionality to describe the use of the real-time transport protocol control protocol (RTCP) in ITU-T H.248-controlled media gateways. RTCP is used for instance to monitor the quality of service and to convey information about the participants in an on-going real-time transport protocol (RTP) session.

[ITU-T H.248.1] assumes that when an RTP stream is specified in a local or remote descriptor, that an RTCP flow may be established according to the rules defined in section 11 of [IETF RFC 3550]. Additional ITU-T H.248/RTCP behaviour is defined in clause E.12.5 of [ITU-T H.248.1]. However, some media gateways may not instantiate an RTCP flow. For interoperability and for some applications such as firewall and network address translation (NAT), it is important for the MGC to be certain of the media gateway behaviour with respect to port allocation for RTCP. The "RTCP Handling Package" defined in this Recommendation provides a property to control this RTCP flow allocation.

1.1 Overview

RTCP *handling* may comprise the following functions:

1) Indication of the *existence* of an RTCP flow of an RTP session (RTP with or without RTCP).
2) Indication of *endpoint identifiers* on *RTP level* that are relevant for both RTP and RTCP (e.g., SSRC).

In addition, if an RTCP flow exists:

3) Resource management of *endpoint identifiers* on *layer 4* (UDP *ports*; i.e., reservation, allocation and indication of a specific allocation rule) for RTCP flows.
4) Resource management of *endpoint identifiers* on *RTP level* (e.g., CNAME) for RTCP flows.
5) Resource management of *other resources* required for RTCP flows (e.g., reservation and allocation of transport capacity).
6) Indication of *specific modes of operation* for RTCP (e.g., layer 4 multiplexing of RTP and RTCP flows, or multiplexing mode of RTCP reports in a single RTCP packet).

Orthogonal to the above functions:

7) Mapping *scheme* of RTP and RTCP flows on H.248 streams.

This Recommendation deals with functions 1 and 3 only. Other functions are out of the scope of this Recommendation.

In addition, this Recommendation assumes that regarding function 7, RTP and RTCP flows are always mapped into a single ITU-T H.248 stream. Other mapping schemes are out of the scope of this Recommendation and may make this Recommendation's procedures irrelevant.

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), *Gateway control protocol: Version 3*. <http://www.itu.int/rec/T-REC-H.248.1>

[IETF RFC 3550] IETF RFC 3550 (2003), *RTP: A Transport Protocol for Real-Time Applications*. <http://www.ietf.org/rfc/rfc3550.txt>

[IETF RFC 3605] IETF RFC 3605 (2003), *Real Time Control Protocol (RTCP) attribute in Session Description Protocol (SDP).* <http://www.ietf.org/rfc/rfc3605.txt>

[IETF RFC 4566] IETF RFC 4566 (2006), *SDP: Session Description Protocol.* <http://www.ietf.org/rfc/rfc4566.txt>

3 Definitions

3.1 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.1.1 RTCP flow: The sending and reception of RTCP packets as described by section 6 of [IETF RFC 3550]. The RTCP flow relates to an "(ITU-T H.248) *control flow*" (see clause 3.9 of [ITU-T H.248.1]).

NOTE – An RTCP flow comprises all RTCP traffic on an RTP session. An RTCP flow may be further separated into RTCP sub-flows due to different RTCP report types. An RTCP sub-flow is identified by a specific RTCP packet type codepoint.

3.1.2 RTP flow: The sending and reception of RTP packets of an *RTP session*. The RTP flow relates to an "ITU-T H.248 *media flow*" (see [ITU-T H.248.1]).

3.1.3 RTP session: An RTP session comprises a single RTP flow and an optional RTCP flow.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AVP Audio Visual Profile

LD Local Descriptor

MG Media Gateway

MGC Media Gateway Controller

NAT Network Address Translation

RD Remote Descriptor

RTCP Real-time Transport protocol Control Protocol

RTP Real-time Transport Protocol

SSRC Synchronization Source

5 Conventions

None.

6 RTCP Handling Package

Package name: RTCP Handling Package

Package ID: rtcph (0x00b5)

Description: This package allows the MGC to indicate to the MG per stream whether or not to establish an RTCP control flow when an RTP media flow (e.g., for RTP profiles such as RTP/AVP, etc.) is created.

Version: 1

Extends: none

6.1 Properties

6.1.1 RTCP Allocation Specific Behaviour

Property name: RTCP Allocation Specific Behaviour

Property ID: rsb (0x0009)

Description: This property indicates whether or not an RTCP flow and an associated port is automatically associated with an RTP flow.

Type: Boolean

Possible values: ON (a RTCP flow shall be allocated or de-allocated automatically with the creation or deletion of the RTP flow);
OFF (a RTCP flow shall not be allocated or de-allocated automatically with the creation or deletion of the RTP flow)

Default: Provisioned

Defined in: Local control

Characteristics: Read/Write

6.2 Events

None.

6.3 Signals

None.

6.4 Statistics

None.

6.5 Error Codes

None.

6.6 Procedures

6.6.1 Reservation and allocation of layer 4 ports for RTP and RTCP

The port number allocation rules, as defined by [IETF RFC 3550], are used as the starting point.

6.6.1.1 Overview – Four RTCP transport addresses

Figure 1 shows a bidirectional RTP session with RTCP in each direction. There are then four traffic flows. The RTP-based media flow and RTCP-based control flow sharing the same IP addresses (see Note as regards possible exceptions), but using normally different L4 (UDP) ports. These four RTCP ports are shown in the diagram.

NOTE – The SDP attribute "a=rtcp:" allows also the explicit specification of an IP network address in addition to the layer 4 port. This may then lead to different IP addresses for RTP and RTCP flows. Figure 1 illustrates the particular case of identical IP addresses.

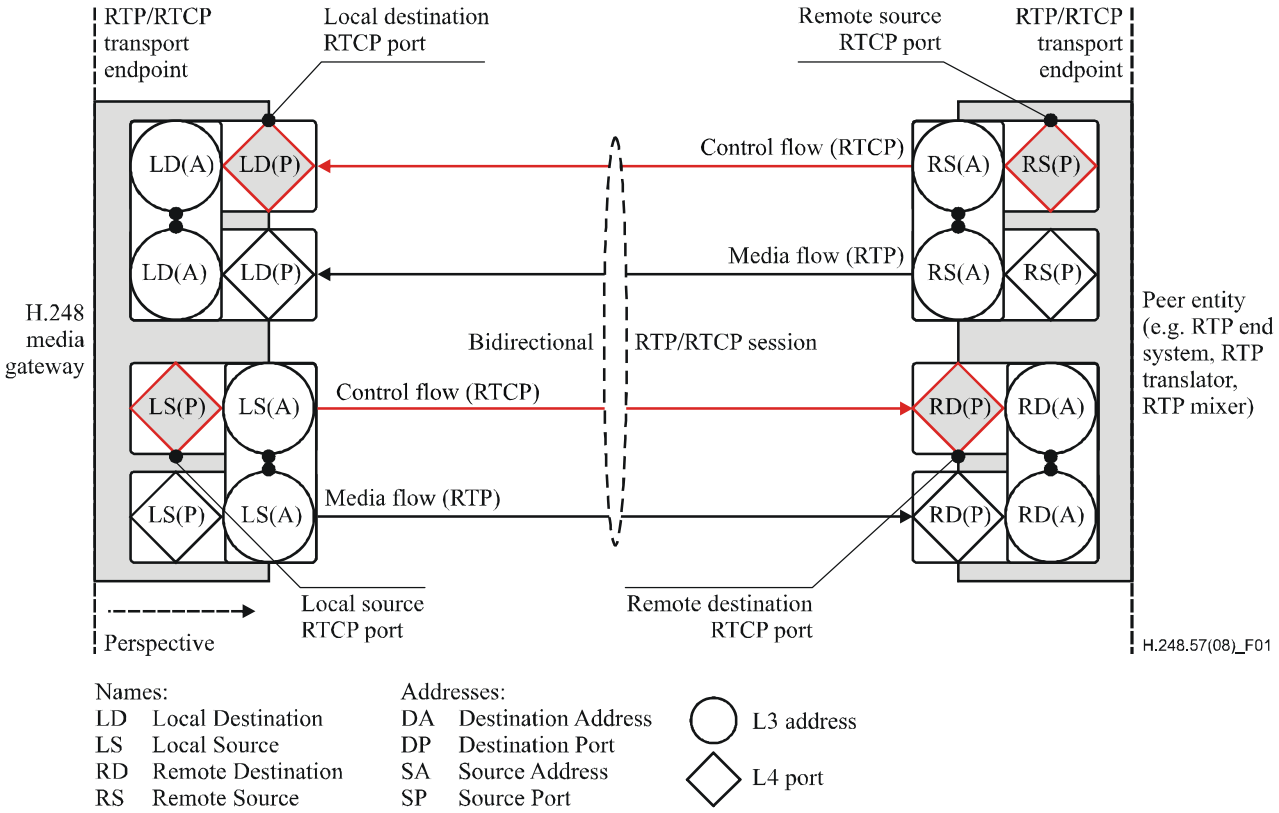

Figure 1 – Connection endpoint naming conventions – the four RTCP ports of a bidirectional RTP/RTCP session

6.6.1.2 Specific behaviour "activated"

If the MGC sets the rtcph/rsb property to "ON", when the MG is requested to allocate/de-allocate a local destination port for an RTP stream, a consecutive port for the reception of the associated RTCP flow is automatically allocated/de-allocated.

6.6.1.3 Specific behaviour "deactivated"

If the MGC sets the rtcph/rsb property to "OFF", then only a single port is allocated to the RTP stream and no RTCP flow is assumed to exist for the stream.

6.6.1.4 Precedence of *rtcph/rsb* property over other port allocation mechanisms

The setting of the *rtcph/rsb* property in general takes precedence over any values set in the local and remote descriptors with regard to port allocation for RTP streams. However, there is one exception: if the rtcph/rsb property is set to ON and a specific RTCP transport address is provided in the local and/or remote descriptor, e.g., using SDP "`a=rtcp:`" attribute as defined in [IETF RFC 3605], the RTCP packets should use the transport addresses indicated by the local/remote descriptors.

6.6.1.4.1 Notes to SDP attribute "`a=rtcp`"

In the scope of this Recommendation, it is noted that:

– the SDP attribute "`a=rtcp:`" allows also the explicit specification of an IP network address in addition to the layer 4 port; and that

– this SDP attribute may be principally also used in the H.248 LD besides its usage in the ITU-T H.248 RD.

Note that both the IP address and the port number appearing in the "`a=rtcp:`" attribute may be underspecified. In this case, the MG is free to allocate any transport address to the RTCP flow (i.e., not necessarily using the same IP address as the RTP flow).

6.6.1.5 Summary of basic rules according to [IETF RFC 3550] and [IETF RFC 3605]

Table 1 provides a summary of the port allocation rules for RTCP.

Table 1 – Allocation rules for RTCP ports with [IETF RFC 3550] (with and without RFC 3605 attribute)

H.248 property value	"a=rtcp" sent to MG?	Local endpoints		Remote endpoints	
		LD(A, P)	LS(A, P)	RD(A, P)	RS(A, P)
rsb = "ON"	No	Consecutive port to the one indicated by the local descript.	MG (Note 1)	Consecutive port to the one indicated by the remote descript.	Out of scope
	Yes in H.248 LD	"a=rtcp" port	MG (Note 1)	–	–
	Yes in H.248 RD	–	–	"a=rtcp:" port	Out of scope
rsb = "OFF"	No	No port allocated	No port allocated	No port allocated	Out of scope
	Yes in H.248 LD	No port allocated (Note 2)	No port allocated (Note 2)	No port allocated (Note 2)	Out of scope
	Yes in H.248 RD	No port allocated (Note 2)	No port allocated (Note 2)	No port allocated (Note 2)	Out of scope
NOTE 1 – The management of LS(A) and LS(P) resources is under control of the media gateway. The MG shall apply the "consecutive" port allocation rule. NOTE 2 – This is a semantic contradiction, however the MG shall ignore the "a=rtcp:" attribute.					

6.6.1.6 Additional rules due to "number of port" qualifier according to [IETF RFC 4566]

[IETF RFC 4566] defines the "number of port" qualifier for the SDP "m=" line used to specify multiple transport ports. The RTCP port allocation rules (Note) are also provided by [IETF RFC 4566] in the case of RTP-based media. The "number of port" qualifier indicates the number of RTP/RTCP flow pairs for a single H.248 stream.

NOTE – Section 5.14 of [IETF RFC 4566] states that "In such a case, the ports used depend on the transport protocol. For RTP, the default is that only the even-numbered ports are used for data with the corresponding one-higher odd ports used for the RTCP belonging to the RTP session, and the <number of ports> denoting the number of RTP sessions " ..." If non-contiguous ports are required, they must be signalled using a separate attribute (for example, "a=rtcp:" as defined in …)".

RTCP port values shall be thus odd numbers, also in case of "a=rtcp" usage. This Recommendation does suppose a single SDP "a=rtcp" attribute per SDP media description ("m=" line) when [IETF RFC 3605] is used.

Table 2 provides a summary of these rules in conjunction with the rsb property.

Table 2 – Allocation rules for RTCP ports for RTP applications using SDP "number of port" qualifier

H.248 property value	"a=rtcp" sent to MG?	Local endpoints		Remote endpoints	
		LD(A, P)	LS(A, P)	RD(A, P)	RS(A, P)
rsb = "ON"	No	Consecutive port to the one indicated by the local descript. (for the first pair) plus rule "contiguous (odd) for each further RTP/RTCP pair"	See Table 1	Consecutive port to the one indicated by the remote descript. (for the first pair) plus rule "contiguous (odd) for each further RTP/RTCP pair"	See Table 1
	Yes in H.248 LD	"a=rtcp:" port (for the first RTP/RTCP pair) plus rule "contiguous (odd) for each further RTP/RTCP pair" (Note 1)	See Table 1	–	–
	Yes in H.248 RD	–	–	"a=rtcp:" port (for the first RTP/RTCP pair) plus rule "contiguous (odd) for each further RTP/RTCP pair" (Note 2)	See Table 1
rsb = "OFF"	No	See Table 1	See Table 1	See Table 1	See Table 1
	Yes in H.248 LD	See Table 1	See Table 1	See Table 1	See Table 1
	Yes in H.248 RD	See Table 1	See Table 1	See Table 1	See Table 1

NOTE 1 – If both 'number of ports' and "a=rtcp:" are indicated in the LD, the RTCP port of the first pair is allocated according to the "a=rtcp:" and the RTP port of the next pair takes the one-higher value to the RTCP port of the last pair. The RTCP port of the next pair takes the consecutive higher number to the RTP port.

NOTE 2 – If both 'number of ports' and "a=rtcp:" are indicated in the RD, the RTCP port of the first pair is allocated according to the "a=rtcp:" and the RTP port of the next pair takes the one-higher value to the RTCP port of the last pair. The RTCP port of the next pair takes the consecutive higher number to the RTP port.

6.6.2 RTP sessions with or without an RTCP flow (existence of RTCP flow)

RTCP is fundamentally optional for RTP.

6.6.2.1 Indication of the existence of RTCP per H.248 stream or termination

As the use of RTCP is optional, the default behaviour of an MG as to the use of RTCP flows is not described in [ITU-T H.248.1]. The default behaviour could be, e.g., defined in an ITU-T H.248 profile specification (see, e.g., template clauses for connection model, stream descriptor or SDP information elements in Appendix III of [ITU-T H.248.1]).

The usage protocol elements (e.g., such as the ITU-T H.248 rtcph/rsb property, or ITU-T H.248 statistics on RTCP basis, or RTCP-specific SDP information elements according to [b-IETF RFC 3556], [IETF RFC 3605] or [b-IETF RFC 3890]) in ITU-T H.248 commands, which provide an indication of RTCP, shall over-rule the default behaviour.

6.6.2.2 RTCP-less RTP sessions

No UDP port (or other resources) for RTCP will be reserved.

6.6.2.3 RTP sessions with RTCP

Handling of RTCP shall follow the guidelines of this Recommendation.

6.6.3 Mapping of RTP and RTCP flows on ITU-T H.248 streams

6.6.3.1 Mapping schemes

6.6.3.1.1 Single ITU-T H.248 stream for RTP and RTCP

The default assumption is that an RTP/RTCP session is mapped on a single ITU-T H.248 stream.

NOTE – This is based on clause E.12 of [ITU-T H.248.1] (in case of usage for ITU-T H.248 RTP terminations) and the reference on RTP profile "RTP/AVP" according to [IETF RFC 3550]. The default media description (e.g., by SDP information elements) for media types/formats for media transport "RTP/AVP" does not explicitly specify RTCP. RTCP is implicitly part of the same ITU-T H.248 stream as for RTP per default.

6.6.3.1.2 Individual ITU-T H.248 streams for RTP and RTCP

An individual ITU-T H.248 stream, solely for RTCP traffic, could be used in principle. But it is so far not possible to provide sufficient information within the ITU-T H.248 stream descriptor for "comprehensive" specification of RTCP flows.

Such an individual ITU-T H.248 stream could be characterized by the 2-tuples of IP address and port (which is not really specific for RTCP).

6.6.3.2 Mapping control

Mapping control is subject of the usage and capabilities of the ITU-T H.248 stream descriptor. There are no protocol means presently available for the individual stream mapping mode.

Property rtcph/rsb shall not be used to influence the mapping between RTP and RTCP flows on ITU-T H.248 streams.

Bibliography

[b-IETF RFC 3551] IETF RFC 3551 (2003), *RTP Profile for Audio and Video Conferences with Minimal Control.* <http://www.ietf.org/rfc/rfc3551.txt>

[b-IETF RFC 3556] IETF RFC 3556 (2003), *Session Description Protocol (SDP) Bandwidth Modifiers for RTP Control Protocol (RTCP) Bandwidth.* <http://www.ietf.org/rfc/rfc3556.txt>

[b-IETF RFC 3890] IETF RFC 3890 (2004), *A Transport Independent Bandwidth Modifier for the Session Description Protocol (SDP).* <http://www.ietf.org/rfc/rfc3890.txt>

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