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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Communication procedures

Gateway control protocol: RTCP XR block reporting package

Recommendation ITU-T H.248.48

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Recommendation ITU-T H.248.48

Gateway control protocol: RTCP XR block reporting package

Summary

Recommendation ITU-T H.248.48 defines packages which allow media gateways (MGs) to report media transmission quality and call quality to media gateway controllers (MGCs) using metrics defined in a series of Real-time Transport Protocol Control Protocol (RTCP) extended report (XR) blocks (see IETF RFC 3611).

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T H.248.48	2012-02-13	16

FOREWORD

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

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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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Gateway control protocol: RTCP XR block reporting package

1 Scope

This Recommendation defines packages which allow media gateways (MGs) to report media transmission quality and call quality to media gateway controllers (MGCs) using metrics defined in a series of Real-time Transport Protocol Control Protocol (RTCP) extended report (XR) blocks standardized by IETF [IETF RFC 3611]. The Recommendation is applicable to MGs which have at least one interface which uses the Real-time Transport Protocol (RTP) [IETF RFC 3550].

The RTCP XR metrics family may be applied to unicast bidirectional RTP sessions including zero or more RTP translators as well as two RTP end systems.

NOTE – These models (including the RTP mixer) are the high-level RTP system models according to [IETF RFC 3550]. [b-IETF RFC 5117] is an extension and provides RTP topology models at a more detailed level. All these models are applicable in principle to ITU-T H.248.48 because an ITU-T H.248 IP stream or termination point may be a node of such an RTP topology. The particular RTP topology may in principle affect the processing of the report.

For instance, the RTP translator model is divided into an "RTP transport translator" and an "RTP media translator" model. The first one is media-agnostic, the second one is media-aware. The individual modes have a different impact on RTCP packet types and/or report information.

For such RTP sessions, an MG may receive the RTCP XR metrics family reports from one or more of the other RTP systems involved in the RTP session, up to a possible maximum of all the RTP systems other than itself.

The package in [ITU-T H.248.48] uses a sub-list of Octet String to permit transfer of a variable number of the RTCP XR metrics family reports in an ITU-T H.248 Statistics descriptor. Each Octet String contains all the data from a single RTCP XR packet, which contains measurements made at one RTP system of one or more streams originating at another RTP system (or systems). The RTCP XR packet contains the synchronization source (SSRC) [IETF RFC 3550] of the RTP system which made the measurement, and an SSRC for each RTP system which originated a measured stream. This enables the MGC (or other entity observing the report) to determine the section of the RTP session to which the report applies.

Through the use of ITU-T H.248 Properties, this package allows the MGC to control the following aspects of MG behaviour:

– the reporting of a specified set of Report Blocks, measured locally at the MG, towards the MGC as ITU-T H.248 Statistics.

– the collection of RTCP XR packets incoming to the MG for reporting towards the MGC as ITU-T H.248 Statistics. No more than one RTCP XR packet is to be stored for each unique tuple of the Originating Point and Measurement Point. An existing stored packet is overwritten by the next packet to arrive for the same tuple.

– the forwarding of RTCP XR packets by RTP translators, including whether RTP translators forward packets which were generated by other RTP translators.

The RTCP XR family is intended to be extensible and it is the intention that this package will not require modification if RTCP XR is extended. Hence property values which control the RTCP XR blocks which are to be reported by the MG are defined by reference to Session Description Protocol (SDP) syntactical elements standardized additively in [IETF RFC 3611] and in RTCP XR. As new RTCP XR blocks are defined, allowable property values are implicitly extended with the SDP defined for the new block.

In addition, the MGC may control the sending of a specified set of RTCP XR report blocks (alongside RTP media) by an MG which is an RTP system (end system, mixer or translator), by addition to the remote descriptor of the same standardized SDP attribute, in "a=rtcp-xr:" lines.

The new statistic *xrbr/xrpkt* may be sent by the MG to the MGC in an ITU-T H.248 response to an Audit or Subtract command, in a similar manner to other ITU-T H.248 Statistics. It may also be sent by the MG in parameter *scr/val* in an Observed Event of the Statistic Conditional Reporting Package [b-ITU-T H.248.47]. No immediate ITU-T H.248 action is initiated by the arrival of RTCP XR packets at the MG, but (depending on the value of *xrbr/scpo*) the incoming packet may be stored for future reporting. If a packet is stored, it overwrites any previously-stored packet having the same tuple of Originating Point and Measurement Point.

The MGC may reset the values of locally-measured metrics within reports in the Statistic Descriptor. It is not possible to reset the values of metrics received in RTCP metrics family reports from remote systems.

Detailed descriptions of RTCP XR metrics are not repeated here; refer to [IETF RFC 3611].

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 Amd.2] Recommendation ITU-T H.248.1 Amd.2 (2009), *Gateway control protocol: Version 3: Corrections and clarifications.*

[IETF RFC 3550] IETF RFC 3550 (2003), RTP: *A Transport Protocol for Real-Time Applications.*

[IETF RFC 3611] IETF RFC 3611 (2003), *RTP Control Protocol Extended Reports (RTCP XR).*

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 CNAME [IETF RFC 3550]: Canonical Name, a persistent transport-level identifier for a RTP source.

3.1.2 measurement point (MP) [b-ITU-T M.2301]: The physical or logical point at which measurements can be made and to which the data obtained is related. In the context of this Recommendation, the RTP system which receives one or more streams of RTP packets, makes measurements on the streams, and may generate RTCP XR packets containing the resulting metrics for transmission towards other RTP systems. The MG may be a Measurement Point. The SSRC of the Measurement Point is present in the RTCP XR header of an RTCP XR packet, see clause 2 of [IETF RFC 3611].

3.1.3 RTCP XR [IETF RFC 3611]: RTCP Extended Reports. RFC 3611 defines both an extensible scheme for definition of new "blocks" to contain metrics, and the first set of seven blocks which use this scheme.

3.1.4 SDES [IETF RFC 3550]: Source Description RTCP packet containing Source Description items including CNAME.

3.1.5 SSRC [IETF RFC 3550]: Synchronization Source identifier.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 filtering point (FP): Point at which the RTCP traffic is policed. The conditions of the FP policy rules here are typically based on RTP/RTCP information elements. The MGC may set policy on the MG to control this filtering, via the property *xrbr/sfpo*. The actions of FP policy rules are described in clause 6.1.2 below.

3.2.2 originating point (OP): The RTP system which originates a stream of RTP packets. For this package, the Originating Point is a synchronization source for the RTP packets according to [IETF RFC 3550], and hence must be an RTP end system or RTP mixer.

3.2.3 reporting point (RP): An MG which implements the current package, defined as the device which sends suitably coded RTCP XR reports as an ITU-T H.248 Statistic towards the MGC.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

CNAME	Canonical Name
FP	Filtering Point
MG	Media Gateway
MGC	Media Gateway Controller
MP	Measurement Point
OP	Originating Point
QoS	Quality of Service
RP	Reporting Point
RR	(RTCP) Receiver Report
RTCP	RTP Control Protocol
RTP	Real-time Transport Protocol
SDES	Source Description
SDP	Session Description Protocol
SR	(RTCP) Sender Report
SSRC	Synchronization Source
VoIP	Voice over Internet Protocol
XR	(RTCP) Extended Report

5 Conventions

None.

6 RTCP XR Block Reporting Package

Package name: RTCP XR Block Reporting Package

Package ID: xrbr (0x00af)

Description: Package for collection of metrics data for RTCP XR report blocks using the RTCP XR metrics architecture, and for control of gateway behaviour with respect to generation, forwarding, and collection of these report blocks.

Version: 1

Extends: None

6.1 Properties

6.1.1 Select Remote Measurement Packets for Reporting by Origination

Property name: Select Remote Measurement Packets for Reporting by Origination

Property ID: scpo (0x0001)

Description: Selects which RTCP XR packets arriving at the MG are collected in the Statistics Descriptor and sent to the MGC. Packets are selected based on the type of RTP system which originated them. The two possibilities that may be distinguished at the MG are packets from an RTP translator (not a synchronization source for RTP), or packets that are from either an RTP end system or an RTP mixer (both of which are synchronization sources for RTP). An RTCP XR packet from an RTP end system may be recognized because it has a sender SSRC in the RTCP XR header that is identical to an SSRC that appears in RTP media packets received at the same ephemeral termination. An RTCP XR packet from an RTP translator may be recognized because it has a sender SSRC in the RTCP XR header that is not identical to an SSRC that appears in any RTP media packet received at the same ephemeral termination. Local measurements to be sent as RTCP XR metrics blocks to the MGC are specified by property *xrbr/srb* (see clause 6.1.3 below) and are not affected by *xrbr/scpo*.

This package does not provide any means to restrict the set of RTCP XR block types reported to the MGC from RTCP XR packets incoming to the MG. Selection by this property is at the granularity of a complete RTCP XR packet.

Type: Sub-list of enumeration

Possible values: The sub-list contains one or two of the following:

N (0x0001): Select no packets for forwarding to remote RTP entities

E (0x0002): Select packets from an RTP end system or RTP mixer

T (0x0003): Select packets from an RTP translator

If enumeration value N is selected, it must be the only value present. If N is not present, the list may hold E alone, T alone, or both E and T together.

Default: N

Defined in: LocalControl

Characteristics: Read/Write

6.1.2 Select Forwarded Packets by Origination

Property name: Select Forwarded Packets by Origination

Property ID: sfpo (0x0002)

Description: Selects which RTCP XR packets arriving at the MG are forwarded in RTCP towards other RTP systems involved in the RTP session. Packets are selected based on the type of RTP system which originated them. The two possibilities that may be distinguished at the MG are packets from an RTP translator (not a synchronization source for RTP), or packets that are from either an RTP end system or RTP mixer (both of which are synchronization sources for RTP). This property is primarily applicable to RTP translators, because it would not be usual for an RTP end system or RTP mixer to forward a received RTCP packet. An RTCP XR packet from an RTP end system or RTP mixer may be recognized because it has a sender SSRC in the RTCP XR header that is identical to an SSRC which appears in RTP media packets received at the same ephemeral termination. An RTCP XR packet from an RTP translator may be recognized because it has a sender SSRC in the RTCP XR header that is not identical to an SSRC that appears in any RTP media packet received at the same ephemeral termination.

This package does not provide any means to restrict the set of RTCP XR block types forwarded from RTCP XR packets incoming to the MG. Selection by this property is at the granularity of a complete RTCP XR packet.

If a packet is forwarded, the forwarded packet should comply with the guidance on RTCP processing in translators, see clause 7.2 of [IETF RFC 3550].

Type: Sub-list of enumeration

Possible values: The sub-list contains one or two of the following:

N (0x0001): Select no packets for forwarding to the MGC

E (0x0002): Select packets from an RTP end system or RTP mixer

T (0x0003): Select packets from an RTP translator

If enumeration value N is selected, it must be the only value present. If N is not present, the list may hold E alone, T alone, or both E and T together.

Default: E

Defined in: LocalControl

Characteristics: Read/Write

6.1.3 Select Local Measurement Blocks for Reporting

Property name: Select Local Measurement Blocks for Reporting

Property ID: srb (0x0003)

Description: Selects which locally-measured RTCP XR block types are reported by the MG to the MGC. Each string element of the sub-list relates to the reporting of a single metrics block type. Locally measured RTCP XR block types may also be generated by the MG towards other RTP systems alongside RTP media. The block types to be generated as RTCP towards other RTP systems may also be controlled via ITU-T H.248. This control is implemented by including SDP "a=rtcp-xr:" lines in the remote descriptor for the stream or termination, as described in clause 6.6.5 below.

Type: Sub-list of String (SDP coding)

Possible values: The syntax of each string element of this property is the SDP defined in the IETF document (e.g. RFC, draft) describing the block type. For example, to specify generation of the Packet Delay Variation block and the Concealed Seconds block, the sub-list could be:

```
["pkt-dly-var,2,npc=100.0,ppc=100.0","conc-sec=50"]
```

This indicates that the packet delay variation and concealed seconds blocks are to be created and reported to the MGC.

The sub-list may be empty to indicate that no blocks are to be reported to the MGC.

Default: Null

Defined in: LocalControl

Characteristics: Read/Write

6.2 Events

None.

6.3 Signals

None.

6.4 Statistics

6.4.1 RTCP XR packets

Statistic name: RTCP XR packets

Statistic ID: xrpkt (0x0001)

Description: Each Octet String in the sub-list codes a complete RTCP XR packet, including the RTCP XR header defined in clause 2 of [IETF RFC 3611] and all the RTCP XR report blocks (see below for behaviour in cases where other RTCP XR block types are also present). "Packet" is used here in the sense of clause 6.1 of [IETF RFC 3550]. There are usually multiple RTCP packets within a UDP datagram containing RTCP, including either an (RTCP) sender report (SR) or (RTCP) receiver report (RR), a source description (SDES), and possibly others including the RTCP XR packet that is the subject of this Statistic. Each such packet type is defined by a unique 8-bit packet type field, which is 207 for RTCP XR.

Not all RTCP XR packets sent or received by the MG are necessarily

forwarded to the MGC in this Statistic. The selection of packets is controlled by the Properties *xrbr/scpo* and *xrbr/srb* described above and in clauses below describing procedures.

Cases are likely to occur in practice where the RTCP XR packet contains RTCP XR block types defined before standardization of the Measurement Identifier block type, as well as RTCP XR block types belonging to the new family of metrics blocks that use the Measurement Identifier block type. An important example is the series of seven RTCP XR block types defined in [IETF RFC 3611] itself, which may be reported using the packages defined in [b-ITU-T H.248.30]. If such a case occurs, the MG encodes the entire RTCP XR packet containing both old- and new-style blocks for transmission to the MGC. The MGC may also request statistics defined in packages of [b-ITU-T H.248.30]. If it does, the data from blocks defined in [IETF RFC 3611] will be duplicated in the Audit response or Subtract response, though in different statistics having different formats. If the MGC does not request statistics of [b-ITU-T H.248.30], it may parse the data in statistic *xrbr/xrpkt* to obtain data corresponding to blocks defined in [IETF RFC 3611], and present in RTCP incoming to the MG. However it will not obtain any data corresponding to blocks defined in [IETF RFC 3611] and measured locally at the MG, because these are not encoded in the statistic *xrbr/xrpkt*.

RTCP XR packets are binary data. They are coded for transmission as an Octet String type as described in clause A.2 of [ITU-T H.248.1 Amd.2] for the binary encoding of the protocol, or using the Hexadecimal Octet Coding described in clause B.3 of [ITU-T H.248.1 Amd.2] for the text encoding of the protocol. See clause 6.6.11 below for an example of coding a packet according to the method of clause B.3 of [ITU-T H.248.1 Amd.2].

Type: Sub-list of Octet String

Possible values: Sub-list of Octet String or Hexadecimal Octet Coding of binary data.

Level: Stream. If a Termination has only one Stream then *xrbr/xrpkt* may be reported at the Termination level.

6.5 Error codes

6.5.1 Unsupported measurement block type

Error Code #: 485

Name: Unsupported measurement block type

Definition: The MGC has requested the MG either to report to the MGC, or to send to another RTP system, an RTCP XR measurement block type which it does not support.

Error text in the Error Descriptor: The SDP text from the property *xrbr/srb* or from the remote descriptor describing the unsupported block.

Comment: None

6.5.2 Unsupported block parameter value

Error Code #:	486
Name:	Unsupported block parameter value
Definition:	The MGC has requested the MG either to report to the MGC, or to send to another RTP system, a parameterised RTCP XR measurement block type. The MG supports the block type only for certain values of the parameters. The MG does not support the block type for the parameter value specified.
Error text in the Error Descriptor:	The SDP text from the property *xrbr/srb* or from the remote descriptor describing the unsupported block.
Comment:	None

6.5.3 Inconsistent block type parameters

Error Code #:	487
Name:	Inconsistent block type parameters
Definition:	The MGC has requested the MG to report a parameterized block type to the MGC, and to send the same block type to another RTP system, but the parameters specified in the two cases are different and cannot be supported simultaneously.
Error text in the Error Descriptor:	The SDP text from the property *xrbr/srb* or from the remote descriptor describing the unsupported block (whichever is received later at the MG).
Comment:	None

6.6 Procedures

6.6.1 Overview

The primary role of the MG in connection with this package is to act as a reporting point. In this role it may code transmitted and received RTCP XR packets in the statistic *xrbr/xrpkt* of the package, and to send this statistic to the MGC. Support of this primary role usually requires making local measurements on incoming packet streams.

Here, a transmitted RTCP XR packet is one containing metrics measured at the MG on packet streams incoming to the MG. Packets of this type may be physically transmitted by the MG, as part of an RTCP packet sent towards other RTP systems participating in the RTP session [IETF RFC 3550]. However, it is also possible for the MG to make measurements on the incoming packet stream and format them into RTCP XR blocks in an RTCP XR packet which, though it is not transmitted in RTCP, is coded and sent towards the MGC as one of the Octet String elements of statistic *xrbr/xrpkt*. These local measurements are sent to the MGC using the same format as that used when the MG forwards to the MGC reports received in RTCP from other RTP systems of the RTP session.

6.6.1.1 Application of RTCP Source Description Package

It is assumed that, if the MG uses the current package to send RTCP XR metrics blocks to the MGC, it will always use the RTCP Source Description (*rtcpsdes*) package in [b-ITU-T H.248.71] to send information linking all the SSRC (Synchronization Source identifiers) to the corresponding canonical names (CNAMEs).

6.6.2 Example RTP session and RTCP XR metrics blocks

Figure 1 shows an example RTP session with two RTP end systems with CNAMEs *gw1.t1.com* and *gw7.t2.com*, and an RTP translator with CNAME *sbc3.t1.com*. Both RTP end systems generate RTCP XR blocks for Voice over Internet Protocol (VoIP) metrics (clause 4.7 of [IETF RFC 3611]) and packet receipt time (clause 4.4 of [IETF RFC 3611]), and send them towards other RTP systems participating in the RTP session. In addition, the RTP translator generates RTCP XR blocks for VoIP metrics for both incoming streams (one from each RTP end system of the session), and sends them to other participants in the RTP session. All RTP systems allocate synchronization source identifiers for themselves, unique within the scope of the RTP session. When this example is used below, we assume that the RTP end system *gw1.t1.com* is the MG. Other RTP systems may be controlled by ITU-T H.248.

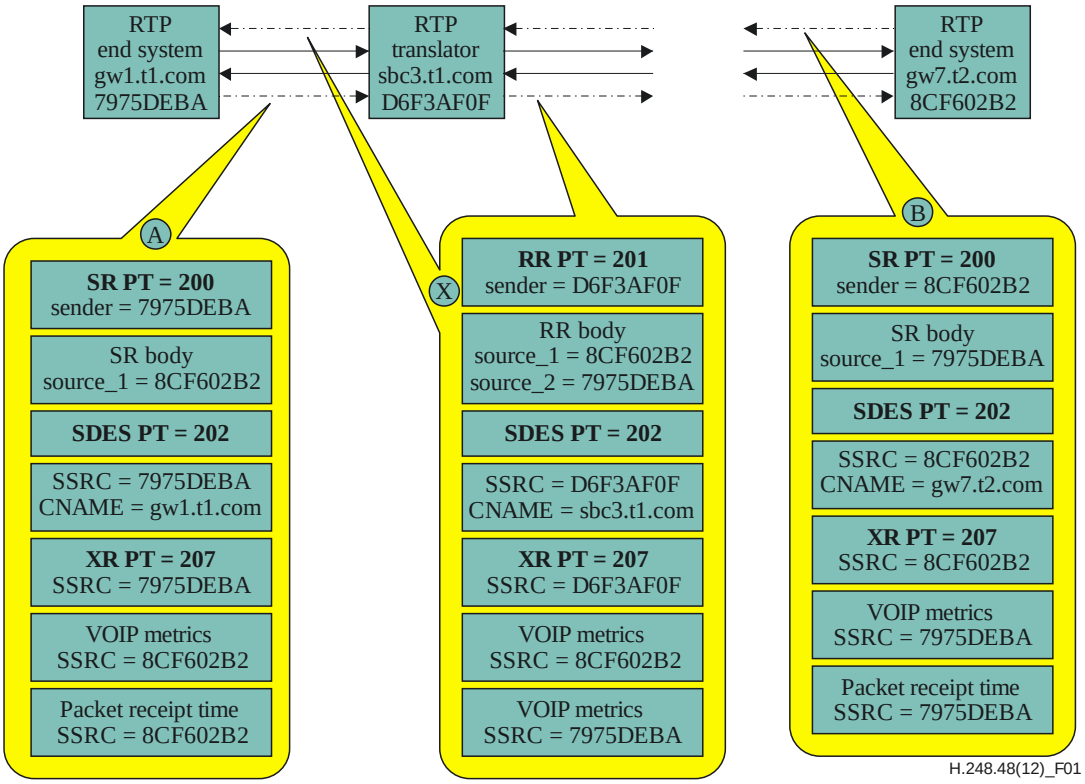

Figure 1 – An example RTP session showing RTCP packets at the RTP interface (ITU-T H.248 reporting MG is the left-hand RTP end system gw1.t1.com)

Figure 2 provides an overview of the coding of the resulting RTCP XR packets (those either reported or collected at the MG) into the statistic *xrbr/xrpkt* of the package. It also shows that the resulting CNAME-SSRC "database" is coded into statistics of the RTCP source description package *rtcpsdes* [b-ITU-T H.248.71], so that the MGC may interpret the SSRCs present in the coded RTCP XR headers within *xrbr/xrpkt*.

Coding of a complete RTCP XR packet is shown in detail in clause 6.6.11 below.

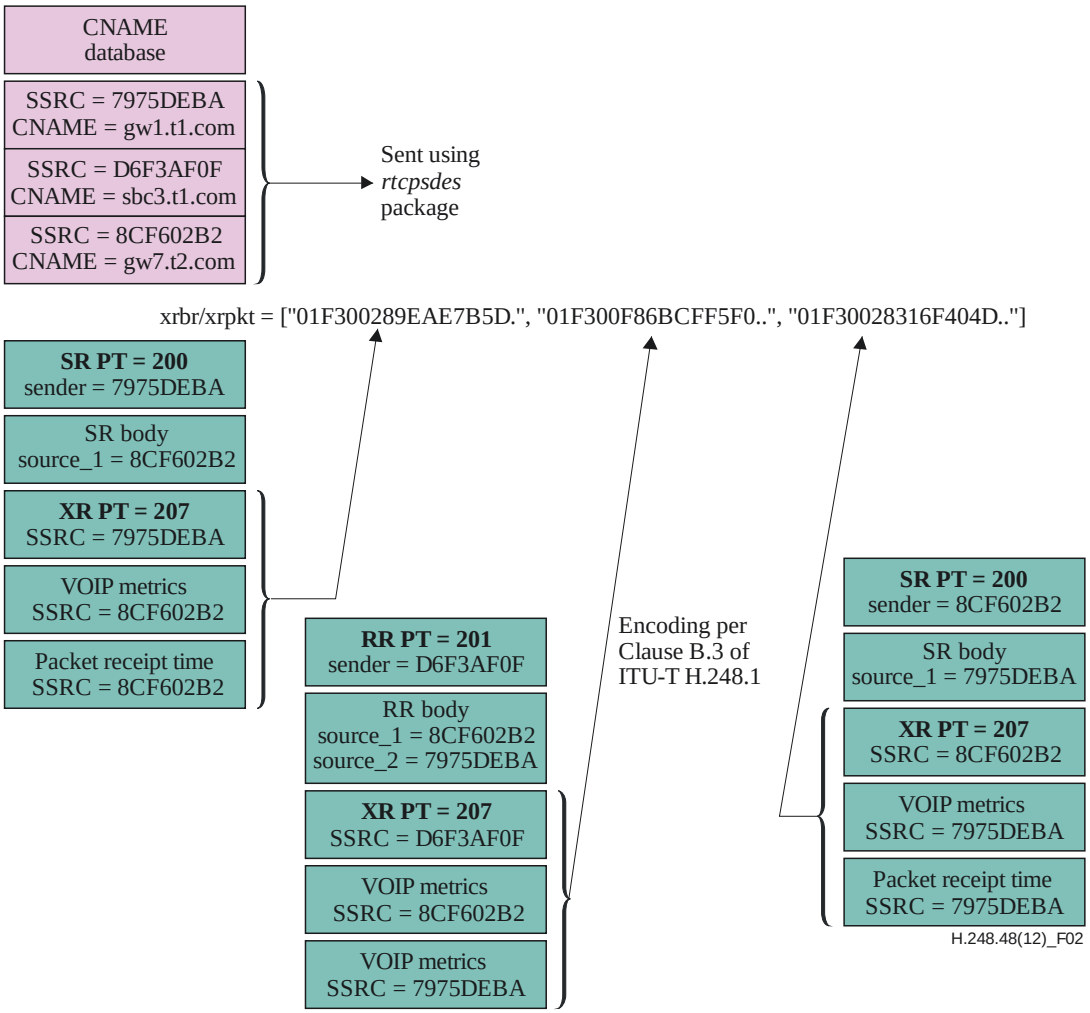

Figure 2 – ITU-T H.248 Reporting point – Coding RTCP XR packets and the CNAME database

6.6.3 Controlling the measurements to be made at the MG

Where an MG makes measurements and creates an RTCP XR packet that may either be sent in RTCP to other RTP systems, or be sent as an element of a statistic *xrbr/xrpkt* to the MG, or both, it is necessary to control the measurements to be made by the MG.

Property *xrbr/srb* ("Select Local Measurement Blocks for Reporting") specifies the metrics blocks to be reported by the MG to the MGC, which must therefore be populated with measurements made locally on RTP streams at the MG. Procedures for the use of property *xrbr/srb* are described in more detail in clause 6.6.4 below.

If the MG does not support a requested block type, it returns error 485, "*Unsupported measurement block type*". If the MG supports a parameterised block type for certain values of the parameters defining the block, but not for the parameter values specified in the request, it returns error 486 "*Unsupported block parameter value*".

The MG may also make measurements to populate metrics blocks that are sent as RTCP XR packets (alongside the RTP media packets) to other RTP systems participating in the RTP session. This function is controlled by lines in the SDP within the remote descriptor for the appropriate ephemeral termination, and is described in more detail in clause 6.6.5 below.

Because the MG may send RTCP XR metrics blocks both towards its MGC in the statistic *xrbr/xrpkt* of this package, and towards other RTP systems of the RTP session as RTCP XR packets alongside RTP media, the MG must make sufficient measurements to populate both sets of metrics blocks. The set of metrics blocks that must be populated by the MG is the set union of those specified in property *xrbr/srb* for reporting to the MGC, and those specified with SDP in the remote descriptor for reporting in RTCP XR to other RTP systems. The MG should make the necessary measurements to populate the specified metrics blocks in this set union.

Because metrics blocks for local measurement are specified independently in *xrbr/srb* and in the remote descriptor, it is possible to specify the same metrics block in the two places, but with different parameters in those cases where the metrics block has optional features controlled by SDP. Some syntactically permitted combinations may exceed the capability of the MG. The MGC should ensure that the union of requests for metrics blocks specified by property *xrbr/srb* and of requests for metrics blocks specified by SDP in the remote descriptor are within the capability of the MG.

If the MG does not support the combination of blocks specified jointly in property *xrbr/srb* and the remote descriptor, it returns error 487 "*Inconsistent block type parameters*" in response to the request which reveals the inconsistency.

6.6.4 Specifying metrics blocks measured at the MG and reported to the MGC

Property *xrbr/srb* (Select Local Measurement Blocks for Reporting) specifies the RTCP XR metrics blocks to be populated at the MG based on its measurements on incoming RTP streams, and reported to the MGC.

The syntax of *xrbr/srb* is a sub-list of OctetString, where each OctetString is an instance of the block-specific SDP defined in the specification which describes the required block.

For example, in order to send the RTCP XR [IETF RFC 3611] blocks for run length encoding of reports, VoIP metrics, and receiver reference time report to the MGC. Property *xrbr/srb* would be set to:

```
["pkt-loss-rle=100","voip-metrics","rcvr-rtt=all:100"]
```

The numerical values are parameters used to control the collection of statistics by the MG. Their use is described in [IETF RFC 3611].

6.6.5 Specifying metrics blocks measured at the MG and sent to peer RTP systems

In the text encoding of the protocol, metrics blocks to be sent in RTCP XR packets alongside media towards other RTP systems are specified in an "a=rtcp-xr:" line of the SDP media description in the remote descriptor, where the text following the "a=rtcp-xr:" element is the syntax element *xr-format* defined additively in [IETF RFC 3611].

If the MG does not support a requested block type, it returns error 485, "*Unsupported measurement block type*". If the MG supports a parameterised block type for certain values of the parameters defining the block, but not for the parameter values specified in the request, it returns error 486 "*Unsupported block parameter value*".

If the MG does not support the combination of blocks specified jointly in property *xrbr/srb* and the remote descriptor, it returns error 487 "*Inconsistent block type parameters*" in response to the request which reveals the inconsistency.

6.6.6 Specifying the collection of received RTCP XR packets for the MGC

An RTCP XR packet received at the MG from another RTP system participating in the RTP session, and containing RTCP XR blocks, may be coded into the statistic *xrbr/xrpkt* and sent to the MGC. The property *xrbr/scpo* (Select Remote Measurement Packets for Reporting by Origination) allows the MGC to select which RTCP XR packets are collected by the MG and sent to the MGC. property *xrbr/scpo* specifies whether the MG collects RTCP XR packets which it receives from

RTP end systems and RTP mixers, and whether the MG collects RTCP XR packets which it receives from RTCP translators. The property is a sub-list of enumeration, so it is possible to specify the collection of neither type of report (an empty sub-list), either type, or both types.

RTCP XR packets are recognized as from RTP end systems because the SSRC in the RTCP XR header is identical to an SSRC in an RTP packet received at the same ephemeral termination. RTCP XR packets are recognized as from RTP translators because the SSRC in the RTCP XR header is not identical to an SSRC in any RTP packet received at the same ephemeral termination.

In the example above, the MG collects packets from its peer RTP end system and from an RTP translator, as well as reporting the RTCP XR packet containing its own measurements. Hence property *xrbr/scpo* is set to

```
[E,T].
```

The transmission to the MGC of metrics blocks containing the MG's local measurements is controlled by property *xrbr/srb* and not by property *xrbr/scpo*.

6.6.7 Specifying the forwarding of RTCP XR packets to other RTP systems

An RTCP XR packet received at the MG from another RTP system participating in the RTP session, and containing RTCP XR blocks, may be forwarded by the MG in RTCP towards other RTP systems participating in the RTP session. The property *xrbr/sfpo* (Select Forwarded Packets by Origination) allows the MGC to select which RTCP XR packets are forwarded by the MG. Property *xrbr/sfpo* specifies whether the MG forwards RTCP XR packets which it receives from RTP end systems and RTP mixers, and separately whether the MG forwards RTCP XR packets which it receives from RTCP translators. The property is a sub-list of enumeration. It is possible to specify the forwarding of "neither type of report", "either type" or "both types".

In the example above, the MG is an RTP end system and does not forward RTCP packets. However the RTP translator *sbc3.t1.com* forwards RTCP XR packets from RTP end systems, but not from other translators. If *sbc3.t1.com* were controlled by ITU-T H.248, then property *xrbr/sfpo* would be set to

```
[E].
```

RTP translator *sbc3.t1.com* also generates RTCP XR packets based on its own measurements. As an informative example, if controlled by ITU-T H.248 its MGC would provide the following SDP line in remote descriptors to cause each termination to measure, and send in RTCP XR [IETF RFC 3611], VoIP metrics and receiver reference time blocks:

```
a=rtcp-xr:voip-metrics rcvr-rtt=all
```

An ITU-T H.248-controlled RTP translator may, of course, also report statistics to its MGC, and procedures for this are identical to those discussed above for the case of the RTP end system.

6.6.8 Audit and reset of statistics

An MGC may retrieve statistics *xrbr/xrpkt* by standard ITU-T H.248 methods using Subtract or AuditValue commands. For statistic *xrbr/xrpkt*, an AuditValue or Subtract will cause the most recently received RTCP XR packets from remote RTP systems to be returned, if selected by property *xrbr/scpo*. These received packets may several seconds old even if RTCP is sent frequently by the peer RTP systems. However for the MG's locally-measured metrics blocks, an AuditValue or Subtract shall sample the most recent values of the local measurements. This requires the MG to create an RTCP XR packet with metrics blocks (according to *xrbr/srb*) containing these most recent measurements, triggered on demand by the AuditValue or Subtract request.

An MGC may suspend collection of locally-measured RTCP XR metrics with block-level granularity by sending a modified property *xrbr/srb* that does not include the block or blocks. The suspended block(s) maintain their value until Subtract, unless a further modified value of *xrbr/srb* is sent which includes a previously-suspended block or blocks. If this occurs the statistic is reset and re-enabled. See also *Practices on Statistics* in Appendix IV of [ITU-T H.248.1 Amd.2].

A use case for auditing statistics values (via AuditValue) and reset arises as follows. An MGC may modify an ephemeral termination during its lifetime with changed (remote destination connection) endpoint information in the remote descriptor such that it receives RTP packets from a different source, and in this case the MGC may audit and reset statistics near the time of modification so that the MGC has independent statistics for the RTP data received from the two sources.

However, it may be undesirable to reset values of metrics that are measured locally and sent to remote RTP systems, because the remote RTP system may be unaware of the reset action and may infer false information about the quality of the IP transport connection between the RTP systems. Because RTCP XR tags metrics blocks with the synchronization source (SSRC) identifier for the source of the measured packets, it is not normally necessary to reset statistics on a termination when a termination is modified to receive packets from another source. However, this requires the MG to maintain (typically until Subtract) statistics for RTP sources which are no longer active.

There is a known use case where the MGC may not be aware that the remote RTP source has changed and therefore may not be able to use an audit-and-reset sequence to ensure separation of metrics related to the two sources. This arises when an MG receives RTP packets from a border device (RTP translator) performing network address and port translation. An RTP session re-arrangement may take place on the far side of the border device, causing the MG to receive packets sourced by a different RTP system, without any MGC involvement or change in the MG's remote descriptor for the termination. However, the SSRC in received RTP media packets will change (it is not modified by a border device which is an RTP translator). In this case, MG awareness of SSRC and maintenance of per-SSRC metrics is the only reliable method of separating packet metrics relevant to the two (or more) remote RTP sources beyond the border device.

6.6.9 MGC Procedure to determine the type of an RTP system

It is assumed that the MGC and MG use the RTCP source description package *rtcpsdes* [b-ITU-T H.248.71] so that the MGC is able to translate dynamically-assigned SSRC identifiers in RTCP XR report blocks into the stable canonical names of the RTP systems involved in the RTP session. SSRC and CNAME data items provided in package *rtcpsdes* are identified by the MG as belonging either to the MG, to a remote RTP end system, or to a remote RTP translator.

6.6.10 Use of cumulative and interval reports

The RTCP XR reports all have two variants, interval (accumulated only since the last report, per source SSRC) and cumulative (accumulated over the lifetime of the RTP session to date, per source SSRC).

Usually the cumulative report is a better match to typical ITU-T H.248 use cases where the MGC receives a report only on Subtract, and it is desirable that this report should contain information about the whole lifetime of the RTP session rather than only about the last few seconds before the Subtract.

6.6.11 Coding example for a complete RTCP XR packet

The following example shows the text coding of a complete RTCP XR packet containing:

– an RTCP XR header and

– Receiver Reference Time Report block (see clause 4.4 of [IETF RFC 3611]),

These are encoded according to the text encoding of Octet String described in clause B.3 of [ITU-T H.248.1 Amd.2]. The structure of this packet is shown in Figure 3, together with the hexadecimal values assumed in this coding example.

The packet shown in Figure 3 below is coded according to the text encoding rules as the following string of length 40 characters for transmission as one of the Octet String elements of statistic *xrbr/xrpkt* across the ITU-T H.248 interface:

"01F300B09EAE7B5D20000040000000004B0A9F08"

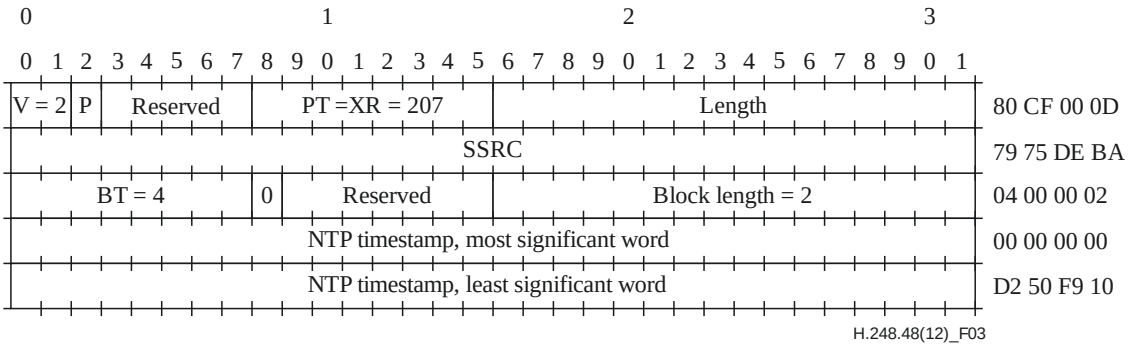

Figure 3 – Structure of an RTCP XR packet at the RTP interface

Bibliography

[b-ITU-T H.248.30] Recommendation ITU-T H.248.30 (2007), *Gateway control protocol: RTCP extended performance metrics packages*.

[b-ITU-T H.248.47] Recommendation ITU-T H.248.47 (2007), *Gateway control protocol: Statistic conditional reporting package*.

[b-ITU-T H.248.71] Recommendation ITU-T H.248.71 (2010), *Gateway control protocol: RTCP support packages*.

[b-ITU-T M.2301] Recommendation ITU-T M.2301 (2002), *Performance objectives and procedures for provisioning and maintenance of IP-based networks*.

[b-IANA RTCP XR] IANA Registry of RTCP XR Block Types at <http://iana.org/assignments/rtcp-xr-block-types/rtcp-xr-block-types.xhtml>

[b-IETF RFC 5117] IETF RFC 5117 (2007), *RTP Topologies*.

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