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RTP Control Protocol (RTCP) Extended Report (XR) Block for Delay Metric Reporting

Abstract

This document defines an RTP Control Protocol (RTCP) Extended Report (XR) block that allows the reporting of delay metrics for use in a range of Real-time Transport Protocol (RTP) applications.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc6843.

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1. Introduction

1.1. Packet Delay Metrics Block

This document defines a new block type to augment those defined in [RFC3611] for use in a range of RTP applications. The new block type supports the reporting of the mean, minimum, and maximum values of the network round-trip delay between RTP interfaces in peer RTP end systems as measured, for example, using the RTCP method described in [RFC3550]. It also supports reporting of the component of the round-trip delay internal to the local RTP system.

The network metrics belong to the class of transport metrics defined in [RFC6792].

1.2. RTCP and RTCP XR Reports

The use of RTCP for reporting is defined in [RFC3550]. [RFC3611] defined an extensible structure for reporting using an RTCP Extended Report (XR). This document defines a new Extended Report block for use with [RFC3550] and [RFC3611].

1.3. Performance Metrics Framework

The Performance Metrics Framework [RFC6390] provides guidance on the definition and specification of performance metrics. The RTP Monitoring Architectures [RFC6792] provides guidelines for reporting block format using RTCP XR. The metrics block described in this document is in accordance with the guidelines in [RFC6390] and [RFC6792].

1.4. Applicability

These metrics are applicable to a range of RTP applications in which this report block would be useful, such as multimedia conferencing and streaming audio and video. Knowledge of the round-trip delay and delay characteristics can aid other receivers in sizing their receive buffers and selecting a playout delay. The same information is also valuable to network managers in troubleshooting network and user experience issues.

2. Terminology

2.1. Standards Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

3. Delay Block

Metrics in this block report on packet delay in the stream arriving at the RTP system. The measurement of these metrics is made either at the receiving end of the RTP stream or at the sending end of the RTP stream. Instances of this metrics block refer by synchronization source (SSRC) to the separate auxiliary Measurement Information block [RFC6776], which contains measurement periods (see [RFC6776], Section 4.2). This metrics block relies on the measurement period in the Measurement Information block indicating the span of the report and SHOULD be sent in the same compound RTCP packet as the Measurement Information block. If the measurement period is not received in the same compound RTCP packet as this metrics block, this metrics block MUST be discarded.

3.1. Report Block Structure

Delay metrics block

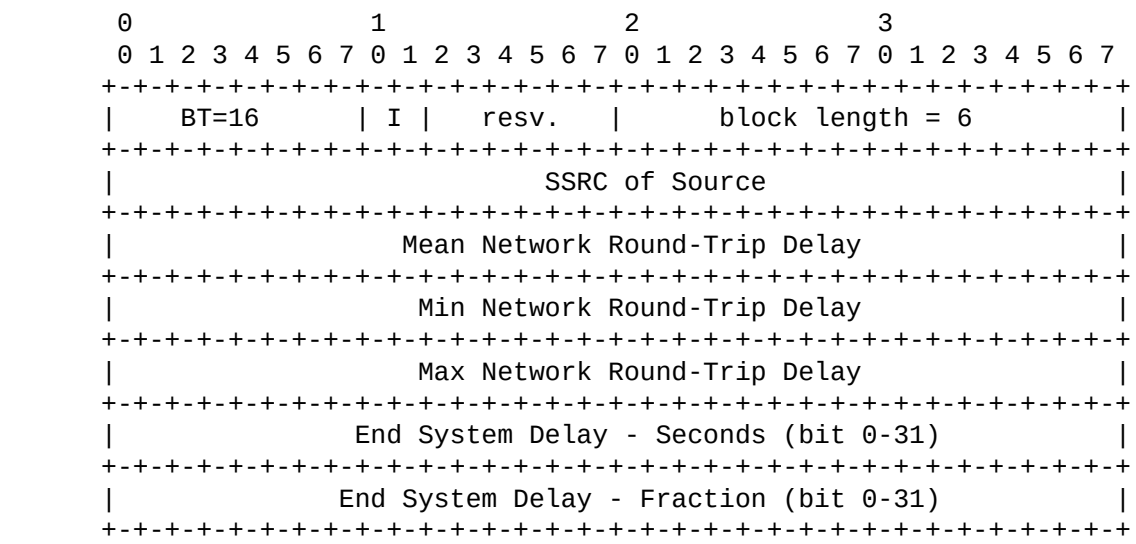

Figure 1: Report Block Structure

3.2. Definition of Fields in Delay Metrics Report Block

Block type (BT): 8 bits

A Delay Report Block is identified by the constant 16.

Interval Metric flag (I): 2 bit

This field is used to indicate whether the delay metrics are Sampled, Interval or Cumulative metrics:

I=10: Interval Duration - the reported value applies to the most recent measurement interval duration between successive metrics reports.

I=11: Cumulative Duration - the reported value applies to the accumulation period characteristic of cumulative measurements.

I=01: Sampled Value - the reported value is a sampled instantaneous value.

Reserved (resv): 6 bits

These bits are reserved. They MUST be set to zero by senders and ignored by receivers (see [RFC6709], Section 4.2).

block length: 16 bits

The length of this report block in 32-bit words, minus one. For the delay block, the block length is equal to 6.

SSRC of source: 32 bits

As defined in Section 4.1 of [RFC3611].

Mean Network Round-Trip Delay: 32 bits

The Mean Network Round-Trip Delay is the mean value of the RTP-to-RTP interface round-trip delay over the measurement period, expressed in units of 1/65536 seconds. This value is typically determined using "the NTP timestamp field" in the RTCP sender report (SR) and "the last SR (LSR) field","delay since last SR (DLSR) field" in the RTCP receiver report (RR) (see [RFC3550], Section 6.4.1 and Figure 2). It also can be determined using "the NTP timestamp field" in the RTCP Receiver Reference Time Report Block and "last RR (LRR) field", "delay since last RR (DLRR) field" in the DLRR Report Block (see [RFC3611], Section 4.5).

If only one measurement of Round-Trip Delay is available for the time span of the report (i.e., the measurement period) (whether Interval or Cumulative), this single value SHOULD be reported as the mean value.

If the measurement is unavailable, the value of this field with all bits set to 1 MUST be reported.

Min Network Round-Trip Delay: 32 bits

The Min Network Round Trip Delay is the minimum value of the RTP-to-RTP interface round-trip delay over the measurement period, expressed in units of 1/65536 seconds. This value is typically determined using the NTP timestamp field in the RTCP SR and LSR field and DLSR field in the RTCP RR. It also can be determined using the NTP timestamp field in the RTCP Receiver Reference Time Report Block and LRR field and DLRR field in the DLRR Report Block.

If only one measurement of Round Trip Delay is available for the time span of the report (i.e., the measurement period) (whether Interval or Cumulative), this single value SHOULD be reported as the minimum value.

If the measurement is unavailable, the value of this field with all bits set to 1 MUST be reported.

Max Network Round-Trip Delay: 32 bits

The Max Network Round-Trip Delay is the maximum value of the RTP-to-RTP interface round-trip delay over the measurement period, expressed in units of 1/65536 seconds. This value is typically determined using the NTP timestamp field in the RTCP SR and LSR field and DLSR field in the RTCP RR. It also can be determined using the NTP timestamp field in the RTCP Receiver Reference Time Report Block and LRR field and DLRR field in the DLRR Report Block.

If only one measurement of Round-Trip Delay is available for the time span of the report (i.e.,the measurement period) (whether Interval or Cumulative), this single value SHOULD be reported as the maximum value.

If the measurement is unavailable, the value of this field with all bits set to 1 MUST be reported.

End System Delay: 64 bits

The End System Delay is the internal round-trip delay within the reporting endpoint, calculated using the nominal value of the jitter buffer delay plus the accumulation/encoding and decoding/playout delay associated with the codec being used. The value of this field is represented using a 64-bit NTP-format timestamp as defined in [RFC5905], which is a 64-bit unsigned fixed-point number with the integer part in the first 32 bits and the fractional part in the last 32 bits.

If the measurement is unavailable, the value of this field with all bits set to 1 MUST be reported.

4. SDP Signaling

[RFC3611] defines the use of SDP (Session Description Protocol) [RFC4566] for signaling the use of XR blocks. XR blocks MAY be used without prior signaling.

4.1. SDP rtcp-xr-attrib Attribute Extension

This section augments the SDP [RFC4566] attribute "rtcp-xr" defined in [RFC3611] by providing an additional value of "xr-format" to signal the use of the report block defined in this document.

```
xr-format =/ xr-delay-block

xr-delay-block ="delay"
```

4.2. Offer/Answer Usage

When SDP is used in offer/answer context, the SDP Offer/Answer usage defined in [RFC3611] applies.

5. IANA Considerations

New block types for RTCP XR are subject to IANA registration. For general guidelines on IANA considerations for RTCP XR, refer to [RFC3611].

5.1. New RTCP XR Block Type Value

This document assigns the block type value 16 in the IANA "RTP Control Protocol Extended Reports (RTCP XR) Block Type Registry" to the "Delay Metrics Block".

5.2. New RTCP XR SDP Parameter

This document also registers a new parameter "delay" in the "RTP Control Protocol Extended Reports (RTCP XR) Session Description Protocol (SDP) Parameters" registry.

5.3. Contact Information for Registrations

The contact information for the registrations is:

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6. Security Considerations

It is believed that this proposed RTCP XR report block introduces no new security considerations beyond those described in [RFC3611]. This block does not provide per-packet statistics, so the risk to confidentiality documented in Section 7, paragraph 3, of [RFC3611] does not apply.

7. Contributors

Geoff Hunt wrote the initial version of this document.

8. Acknowledgments

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