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

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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 applications.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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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 [MONARCH].

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 [MONARCH] provides guideline for reporting block format using RTCP XR. The Metrics Block described in this document are in accordance with the guidelines in [RFC6390] and [MONARCH].

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 are 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 metric 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 metric block, this metric block MUST be discarded.

3.1. Report Block Structure

Delay metrics block

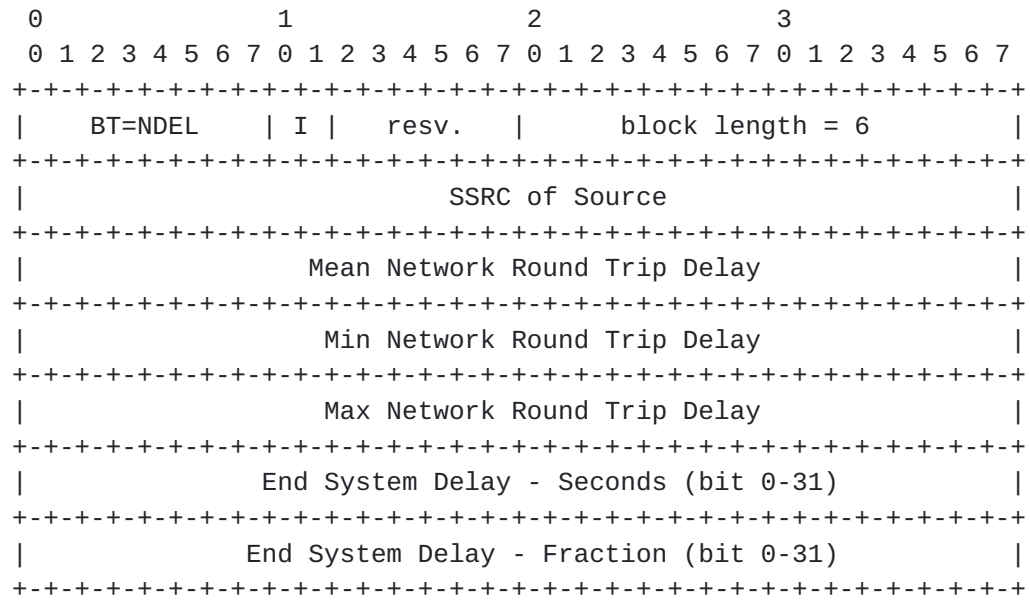

Figure 1: Report Block Structure

3.2. Definition of Fields in Delay Metrics Report Block

Block type (BT): 8 bits

A Delay Report Block is identified by the constant NDEL.

[Note to RFC Editor: please replace NDEL with the IANA provided RTCP XR block type for this block.]

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 NTP timestamp field in the RTCP SR and LSR field and DLSR field in the RTCP RR (See RFC 3550 section 6.4.1 and figure 2). It also can be determined using NTP timestamp field in the RTCP Receiver Reference Time Report Block and LRR field and DLRR field in the DLRR Report Block (See RFC3611 section 4.5).

If only one measurement of Round Trip Delay is available for the timespan 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 NTP timestamp field in the RTCP SR and LSR field and DLSR field in the RTCP RR. It also can be determined using 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 timespan 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 NTP timestamp field in the RTCP SR and LSR field and DLSR field in the RTCP RR. It also can be determined using 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 timespan 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 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 NDEL in the IANA "RTCP XR Block Type Registry" to the "Delay Metrics Block".

[Note to RFC Editor: please replace NDEL with the IANA provided RTCP XR block type for this block.]

5.2. New RTCP XR SDP Parameter

This document also registers a new parameter "delay" in the "RTCP XR SDP Parameters Registry".

5.3. Contact information for registrations

The contact information for the registrations is:

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101 Software Avenue, Yuhua District
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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

The authors gratefully acknowledge the comments and contributions made by Bruce Adams, Philip Arden, Amit Arora, Bob Biskner, Kevin Connor, Claus Dahm, Randy Ethier, Roni Even, Jim Frauenthal, Albert Higashi, Tom Hock, Shane Holthaus, Paul Jones, Rajesh Kumar, Keith Lantz, Mohamed Mostafa, Amy Pendleton, Colin Perkins, Mike Ramalho, Ravi Raviraj, Albrecht Schwarz, Tom Taylor, and Hideaki Yamada,Jing Zhao,Kevin Gross, Colin Perkins, Charles Eckel, Glen Zorn,Shida Schubert,Barry Leiba,Sean Turner,Robert Sparks,Benoit Claise,Stephen Farrell.

9. References

9.1. Normative References

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[RFC3550] Schulzrinne, H., "RTP: A Transport Protocol for Real-Time Applications", RFC 3550, July 2003.

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[RFC4566] Handley, M., Jacobson, V., and C. Perkins, "SDP: Session Description Protocol", July 2006.

[RFC5905] Mills, D., Martin, J., Burbank, J., and W. Kasch, "Network Time Protocol Version 4: Protocol and Algorithms Specification", RFC 5905, June 2010.

[RFC6709] Carpenter, B., Aboba, B., and S. Cheshire, "Design Considerations for Protocol Extensions", RFC 6709, September 2012.

9.2. Informative References

[MONARCH] Hunt, G., "Monitoring Architectures for RTP", ID draft-ietf-avtcore-monarch-22, September 2012.

[RFC6390] Clark, A. and B. Claise, "Framework for Performance Metric Development", RFC 6390, October 2011.

[RFC6776] Hunt, G., "Measurement Identity and information Reporting using SDES item and XR Block", RFC 6776, October 2012.

Appendix A. Change Log

Note to the RFC-Editor: please remove this section prior to publication as an RFC.

A.1. draft-ietf-xrblock-rtcp-xr-delay-12

The following are the major changes to previous version :

- Remove SHOULD from reserved field and add reference to RFC6709.

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