        RTP Control Protocol (RTCP) Extended Report (XR) for Post-Repair
                            Loss Count Metrics
            draft-ietf-xrblock-rtcp-xr-post-repair-loss-count-03

Abstract

   This document defines an RTP Control Protocol (RTCP) Extended Report
   (XR) Block that allows reporting of post-repair loss count metrics
   for a range of RTP applications.

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1 Introduction

RTCP SR/RR [RFC3550] contains some rough statistics about the data
received from the particular source indicated in that block. One of
them is the cumulative number of packet lost, which is called pre-
repair loss metric in this document. This metric conveys information
regarding the total number of RTP data packets that have been lost
since the beginning of the RTP session. However, this metric is
measured on media stream before any loss repair mechanism, e.g.,
retransmission [RFC4588] and Forward Error Correction (FEC)
[RFC5109], is applied. Using a repair mechanism usually results in
recovering some or all of the lost packets. Hence, the sending
endpoint cannot assess the performance of the repair mechanism by
observing the change in fraction loss and the cumulative loss
statistics from RTCP SR/RR [RFC3550]. Consequently, [RFC5725]
specifies a post-repair loss Run-length Encoding (RLE) XR report
block to address this issue. The sending endpoint is able to infer
which packets were repaired from the RLE report block, but at the
cost of higher overhead. When applications use multiple XR blocks,
the endpoints may require more concise reporting to save bandwidth.

This document defines a new XR block type to augment those defined in
[RFC3611] and complement the report block defined in [RFC5725] for
use in a range of RTP application. This new block type reports the
number of primary source RTP packets that are still lost after
applying one or more loss repair mechanisms. The metrics defined in
this document are packet level rather than slice/picture level, which
means the partial recovery of a packet will not be regarded as a
repaired packet. When comparing this metric with pre-repair loss
metric of RTCP SR/RR, ambiguity may occur as noted in [RFC5725]: Some
packets will not be repaired in current RTCP interval. Thus it is
RECOMMENDED that this report block should be generated for those
source packets that have no further chance of being repaired. But a
potential ambiguity may result from sequence number range
inconsistent. The sequence number range reported by RTCP SR/RR may
contain some sequence numbers of packets for which repair might still
be possible. To address this issue, we use begin sequence number and
end sequence number to explicitly indicate the actual sequence number
range that this RTCP XR report block reports on. In addition,
another metric, repaired loss count, is also introduced in this
report block for calculating the pre-repair loss count during the
this range, so that the RTP sender or a third-party entity is able to
evaluate the effectiveness of the repair methods used by the system.
Note that the metrics in this report block MUST NOT be directly
compared with the pre-repair loss metric of [RFC3550].

The metrics defined in this document belongs to the class of
transport-related metrics defined in [RFC6792]. And it is in

accordance with the guidelines in [RFC6390] and [RFC6792]. These
metrics are applicable to any RTP application, especially those that
use loss repair mechanisms.

2 Terminology

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].

primary source RTP packet: The original RTP packet sent from the RTP
sender for the first time. A lost primary source RTP packet may be
repaired by some other RTP packets used in repair mechanisms like FEC
or retransmission.

3 Post-Repair Loss Count Metrics Report Block

This block reports the number of packets lost after applying repair
mechanisms to complement the RTCP XR metrics defined in [RFC5725].
This packet may be stacked with other RTCP packets to form compound
RTCP packets and share the average reporting interval calculated by
the RTCP method described in [RFC3550]. These metrics defined in this
report block are all interval metrics with an explicit sequence
number range to indicate the measurement timing and the measurement
of them is made at the RTP receiver.

The post-repair loss count metrics report block has the following
format:

```
    0                   1                   2                   3                   4
    0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |    BT=PRLR    |    Reserved    |       block length = 4        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                        SSRC of Source                         |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |        begin_seq          |              end_seq              |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |    unrepaired loss count   |      repaired loss count         |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 1: Format for the Post-Repair Loss Count Metrics Report
Block

Block Type (BT): 8 bits

A Post-Repair Loss Count Metrics Report Block is identified by the

      constant PRLR.

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

   Reserved: 8 bits

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

   block length: 16 bits

      This field is in accordance with the definition in [RFC3611]. In
      this report block, it MUST be set to 4. The block MUST be
      discarded if the block length is set to a different value.

   SSRC of source: 32 bits

      As defined in Section 4.1 of [RFC3611].

   begin_seq: 16 bits

      The first sequence number that this block reports on.

   end_seq: 16 bits

      The last sequence number that this block reports on plus one.

   unrepaired loss count: 16 bits

      Total number of packets finally lost after one or more loss-repair
      methods, e.g., FEC and/or retransmission, during this interval.
      This metric MUST NOT count the lost packets for which repair might
      still be possible. Note that this metric must be measured in the
      primary source RTP packets.

   repaired loss count: 16 bits

      Total number of packets fully repaired after one or more loss-
      repair methods, e.g., FEC and/or retransmission, during this
      interval. Note that this metric must be measured in the primary
      source RTP packets.

4 SDP Signaling

   [RFC3611] defines the use of SDP (Session Description Protocol) for
   signaling the use of RTCP XR blocks. However XR blocks MAY be used

without prior signaling (see section 5 of [RFC3611]).

4.1 SDP rtcp-xr-attrib Attribute Extension

This session augments the SDP attribute "rtcp-xr" defined in Section 5.1 of [RFC3611] by providing an additional value of "xr-format" to signal the use of the report block defined in this document.

xr-format =/ xr-prlr-block

xr-prlr-block = "post-repair-loss-count"

4.2 Offer/Answer Usage

When SDP is used in offer-answer context, the SDP Offer/Answer usage defined in [RFC3611] for unilateral "rtcp-xr" attribute parameters applies. For detailed usage of Offer/Answer for unilateral parameter, refer to section 5.2 of [RFC3611].

5 Security Considerations

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

An attacker may put incorrect information in the Post-Repair Loss Count reports, which will be affect the performance of loss repair mechanisms. Implementers should consider the guidance in [I-D.ietf-avtcore-srtp-not-mandatory] for using appropriate security mechanisms, i.e., where security is a concern, the implementation should apply encryption and authentication to the report block. For example, this can be achieved by using the AVPF profile together with the Secure RTP profile as defined in [RFC3711]; an appropriate combination of the two profiles (an "SAVPF") is specified in [RFC5124]. However, other mechanisms also exist (documented in [I-D.ietf-avtcore-rtp-security-options]) and might be more suitable.

6 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].

6.1 New RTCP XR Block Type value

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

the "Post-Repair Loss Count Metrics Report Block".

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

6.2 New RTCP XR SDP Parameter

This document also registers a new parameter "post-repair-loss-count" in the "RTP Control Protocol Extended Reports (RTCP XR) Session Description Protocol (SDP) Parameters Registry".

6.3 Contact Information for registrations

The following contact information is provided for all registrations in this document:

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7 Acknowledgments

The author would like to thank Roni Even and Colin Perkins for giving valuable comments and suggestions.

8 References

8.1 Normative References

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              Correction", RFC 5109, December 2007.

8.2 Informative References

   [RFC6390] Clark, A. and B. Claise, "Guidelines for Considering New
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   [RFC6792] Wu, Q., Hunt, G., and P. Arden, "Guidelines for Use of the
              RTP Monitoring Framework", RFC 6792, November 2012.

Appendix A. Metrics Represented Using the Template from RFC 6390

   a. Unrepaired RTP Packet Loss Count Metric

      * Metric Name: Unrepaired RTP Packet Loss Count Metric

      * Metric Description: Total number of RTP packets still lost after
      loss repair methods are applied

      * Method of Measurement or Calculation: It must be measured for
      the primary source RTP packets with no further chance of repair

      * Units of Measurement: See section 3, unrepaired loss count
      definition

      * Measurement Point(s) with Potential Measurement Domain: See
      section 3, 1st paragraph

      * Measurement Timing: See Section 3, 1st paragraph, for
      measurement timing

      * Use and Applications: See Section 1

      * Reporting Model: See RFC3611

   b. Repaired RTP Packet Loss Count Metric

* Metric Name: Repaired RTP Packet Count Metric

* Metric Description: The number of RTP packets lost but repaired after applying loss repair methods

* Method of Measurement or Calculation: It must be measured for the primary source RTP packets with no further chance of repair

* Units of Measurement: See section 3, repaired loss count definition

* Measurement Point(s) with Potential Measurement Domain: See section 3, 1st paragraph

* Measurement Timing: See Section 3, 1st paragraph, for measurement timing

* Use and Applications: See Section 1

* Reporting Model: See RFC3611

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