AVT
Internet-Draft
Intended status: Standards Track
Expires: February 7, 2009

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August 6, 2008

Post-Repair Loss RLE Report Block Type for RTCP XR
draft-ietf-avt-post-repair-rtcp-xr-01

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Abstract

This document defines a new report block type within the framework of RTP Control Protocol (RTCP) Extended Reports (XR). One of the initial XR report block types is the Loss Run Length Encoding (RLE) Report Block. This report conveys the information regarding the individual Real-time Transport Protocol (RTP) packet receipt and loss events experienced during the RTCP interval preceding the transmission of the report. The new report, which is referred to as

the Post-repair Loss RLE Report, carries the information regarding the remaining lost packets after all error-repair techniques are applied. By comparing the RTP packet receipts/losses before and after the error repair is completed, one can determine the effectiveness of the error-repair techniques in an aggregated fashion. This document also defines the signaling of the Post-repair Loss RLE Report in the Session Description Protocol (SDP).

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1. Introduction

RTP Control Protocol (RTCP) is the out-of-band control protocol for the applications that are using the Real-time Transport Protocol (RTP) for media delivery and communications [RFC3550]. RTCP allows the RTP entities to monitor the data delivery and provides them minimal control functionality via sender and receiver reports as well as other control packets. [RFC3611] expands the RTCP functionality further by introducing the RTCP Extended Reports (XR).

One of the initial XR report block types defined in [RFC3611] is the Loss Run Length Encoding (RLE) Report Block. This report conveys the information regarding the individual RTP packet receipt and loss events experienced during the RTCP interval preceding the transmission of the report. However, the Loss RLE in an RTCP XR report is usually collected only on the primary source stream before any error-repair technique is applied. Once one or more error-repair techniques, e.g., Forward Error Correction (FEC) [RFC5109] and/or retransmission [RFC4588], are applied, some or all of the lost packets on the primary source stream may be recovered. However, the pre-repair Loss RLE cannot indicate which source packets were recovered and which are still missing. Thus, the pre-repair Loss RLE cannot specify how well the error repair performed.

This issue can be addressed by generating an additional report block (within the same RTCP XR report), which reflects the packet receipt/loss events after all error-repair techniques are applied. This report block, which we refer to as the Post-repair Loss RLE, indicates the remaining missing, i.e., unrepairable, source packets. When the pre- and post-repair Loss RLEs are compared, the RTP sender or another third party entity can evaluate the effectiveness of the error-repair techniques in an aggregated fashion.

Note that the idea of using pre- and post-repair Loss RLEs can be further extended when multiple sequential error-repair techniques are applied to the primary source stream. Reporting the Loss RLEs before and after each error-repair technique can provide specific information about the individual performances of these techniques. However, it can be a difficult task to quantify the specific contribution made by each error-repair technique in hybrid systems, where different techniques collectively work together to repair the lost source packets. Thus, in this specification we only consider reporting the Loss RLE after all error-repair techniques are applied. This document registers a new report block type to cover the Post-repair Loss RLE within the framework of RTCP XR.

2. Requirements Notation

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 [RFC2119].

3. Post-Repair Loss RLE Report Block

The Post-repair Loss RLE Report Block is similar to the existing Loss RLE Report Block defined in [RFC3611]. The report is formatted as sketched in Figure 1.

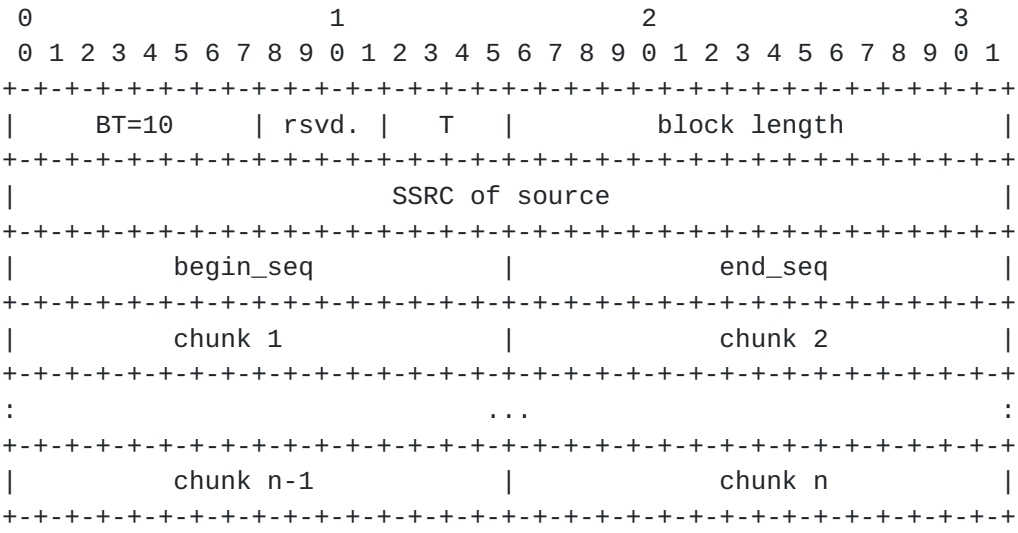


Figure 1: Format for the post-repair loss RLE report block

- block type (BT): 8 bits
  A Post-repair Loss RLE Report Block is identified by the constant 10.

- rsvd.: 4 bits
  This field is reserved for future definition. In the absence of such definition, the bits in this field MUST be set to zero and MUST be ignored by the receiver.

- thinning (T): 4 bits
  The amount of thinning performed on the sequence number space. Only those packets with sequence numbers 0 mod 2^T are reported on by this block. A value of 0 indicates that there is no thinning, and all packets are reported on. The maximum thinning is one packet in every 32,768 (amounting to two packets within each 16-bit sequence space).

- block length: 16 bits
  The length of this report block, including the header, in 32-bit words minus one.

- SSRC of source: 32 bits

  The SSRC of the RTP data packet source being reported upon by this report block.

- 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.

- chunk i: 16 bits
  There are three chunk types: run length, bit vector, and terminating null, defined in [RFC3611] (Section 4). If the chunk is all zeroes, then it is a terminating null chunk. Otherwise, the left most bit of the chunk determines its type: 0 for run length and 1 for bit vector.

4. Session Description Protocol Signaling

A new parameter is defined for the Post-repair Loss RLE Report Block to be used with Session Description Protocol (SDP) [RFC4566]. It has the following syntax within the "rtcp-xr" attribute:

```
    rtcp-xr-attrib = "a=rtcp-xr:" [xr-format *(SP xr-format)] CRLF

         xr-format = "post-repair-loss-rle" ["=" max-size]

         max-size  = 1*DIGIT ; maximum block size in octets
         DIGIT     = %x30-39
         CRLF      = %d13.10
```

Figure 2

Refer to Section 5.1 of [RFC3611] for a detailed description and the full syntax of the "rtcp-xr" attribute.

5. Security Considerations

The security considerations of [RFC3611] apply in this document as

well.

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].

This document assigns the block type value 10 in the RTCP XR Block Type Registry to "Post-repair Loss RLE Report Block." This document also registers the SDP [RFC4566] parameter "post-repair-loss-rle" for the "rtcp-xr" attribute in the RTCP XR SDP Parameters Registry.

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7. Acknowledgments

The authors would like to thank the members of the VQE Team at Cisco and Colin Perkins for their inputs and suggestions.

8. References

8.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC3550] Schulzrinne, H., Casner, S., Frederick, R., and V. Jacobson, "RTP: A Transport Protocol for Real-Time Applications", STD 64, RFC 3550, July 2003.

[RFC3611] Friedman, T., Caceres, R., and A. Clark, "RTP Control Protocol Extended Reports (RTCP XR)", RFC 3611, November 2003.

[RFC4566] Handley, M., Jacobson, V., and C. Perkins, "SDP: Session Description Protocol", RFC 4566, July 2006.

8.2. Informative References

[RFC5109] Li, A., "RTP Payload Format for Generic Forward Error Correction", RFC 5109, December 2007.

[RFC4588] Rey, J., Leon, D., Miyazaki, A., Varsa, V., and R. Hakenberg, "RTP Retransmission Payload Format", RFC 4588, July 2006.

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Acknowledgment

Funding for the RFC Editor function is provided by the IETF Administrative Support Activity (IASA).