

AVT  
Internet-Draft  
Intended status: Standards Track  
Expires: April 24, 2009

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October 21, 2008

**Post-Repair Loss RLE Report Block Type for RTCP XR  
draft-ietf-avt-post-repair-rtcp-xr-03**

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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 loss-repair methods are applied. By comparing the RTP packet receipts/losses before and after the loss repair is completed, one can determine the effectiveness of the loss-repair methods in an aggregated fashion. This document also defines the signaling of the Post-repair Loss RLE Report in the Session Description Protocol (SDP).

## Table of Contents

<a href="#">1.</a>	<a href="#">Introduction</a>	<a href="#">3</a>
<a href="#">2.</a>	<a href="#">Requirements Notation</a>	<a href="#">4</a>
<a href="#">3.</a>	<a href="#">Post-Repair Loss RLE Report Block</a>	<a href="#">4</a>
<a href="#">4.</a>	<a href="#">Session Description Protocol Signaling</a>	<a href="#">6</a>
<a href="#">5.</a>	<a href="#">Security Considerations</a>	<a href="#">6</a>
<a href="#">6.</a>	<a href="#">IANA Considerations</a>	<a href="#">6</a>
<a href="#">7.</a>	<a href="#">Acknowledgments</a>	<a href="#">7</a>
<a href="#">8.</a>	<a href="#">References</a>	<a href="#">7</a>
<a href="#">8.1.</a>	<a href="#">Normative References</a>	<a href="#">7</a>
<a href="#">8.2.</a>	<a href="#">Informative References</a>	<a href="#">7</a>
	<a href="#">Authors' Addresses</a>	<a href="#">8</a>
	<a href="#">Intellectual Property and Copyright Statements</a>	<a href="#">9</a>



## **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 loss-repair method is applied. Once one or more loss-repair methods, 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 loss repair performed.

This issue can be addressed by generating an additional report block (within the same or a different RTCP XR report), which reflects the packet receipt/loss events after all loss-repair methods 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-repair and post-repair Loss RLEs are compared, the RTP sender or another third party entity can evaluate the effectiveness of the loss-repair methods in an aggregated fashion. To avoid any ambiguity in the evaluation, it is RECOMMENDED that the post-repair Loss RLE is generated for the source packets that have no further chance of being repaired. If the loss-repair method(s) may still recover one or more missing source packets, the post-repair Loss RLE SHOULD NOT be sent until the loss-recovery process has been completed.

Similar to the pre-repair Loss RLE, the post-repair Loss RLE conveys the receipt/loss events at the packet level and considers partially repaired packets as unrepaired. Thus, methods that can do partially recover the missing data SHOULD NOT be evaluated based on the information provided by the Post-repair Loss RLE Reports.

Note that the idea of using pre-repair and post-repair Loss RLEs can be further extended when multiple sequential loss-repair methods are applied to the primary source stream. Reporting the Loss RLEs before



and after each loss-repair method can provide specific information about the individual performances of these methods. However, it can be a difficult task to quantify the specific contribution made by each loss-repair method in hybrid systems, where different methods collectively work together to repair the lost source packets. Thus, in this specification we only consider reporting the Loss RLE after all loss-repair methods are applied.

This document registers a new report block type to cover the post-repair Loss RLE within the framework of RTCP XR. Applications that are employing one or more loss-repair methods MAY use Post-repair Loss RLE Reports for every packet they receive or for a set of specific packets they have received. In other words, the coverage of the post-repair Loss RLEs may or may not be contiguous.

## **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 format is shown in Figure 1. Using the same structure for reporting both pre-repair and post-repair Loss RLEs allows the implementations to compare the Loss RLEs very efficiently.



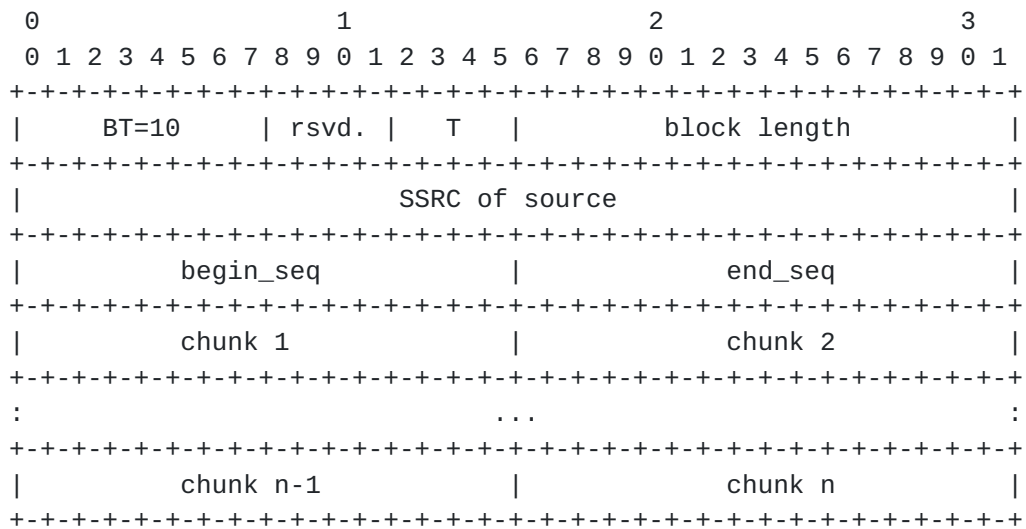


Figure 1: Format for the post-repair loss RLE report block

- o block type (BT): 8 bits  
A Post-repair Loss RLE Report Block is identified by the constant 10.
- o 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.
- o thinning (T): 4 bits  
The amount of thinning performed on the sequence number space. Only those packets with sequence numbers  $0 \bmod 2^T$  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).
- o block length: 16 bits  
The length of this report block, including the header, in 32-bit words minus one.
- o SSRC of source: 32 bits  
  
The SSRC of the RTP data packet source being reported upon by this report block.
- o begin\_seq: 16 bits  
  
The first sequence number that this block reports on.





- o end\_seq: 16 bits

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

- o 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.

Note that the sequence numbers that are included in the report refer to the primary source stream.

#### 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-attr = "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).



