RTCP Extended Report for ECN Marked Packets
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Abstract

This document describes a Real-Time Control Protocol (RTCP) Extended Report (XR) containing information derived from the reception of Explicit Congestion Notification (ECN) marked packets. This document is symbiotic with the approach described in [rtp-ecn], which presents one approach in establishing end-to-end ECN support for real-time sessions.
1 Introduction

Explicit Congestion Notification (ECN) is a dual-layer means of conveying the presence of congestion on an end-to-end manner without dropping packets. The network layer indicates in hop-by-hop IP packets whether or not endpoints support ECN. If yes, then if congestion exists along the downstream path, the IP packet is marked to indicate the congested condition to the endpoint. At the upper layer has the dual responsibility of initially negotiating support for ECN as well as conveying the congested condition to the source endpoint.

The initial realization of ECN was described in [rfc2481], and later obsoleted by [rfc3168]. In both cases, TCP was used as the upper layer transport protocol used to negotiate support for ECN during the establishment of an end-to-end connection and convey through the use of TCP acks the presence of congestion along the downstream path. The architecture presented [rfc3168] also opened the design to allow other upper layer protocols to be substituted for TCP.

1.1. Applicability

This metric is believed to be applicable to all RTP applications which utilise ECN for congestion control or other purposes. Additionally it may be utilised by monitoring systems.

2. Design Approach

Protocols such as SCTP and DCCP are natural candidates for support of ECN due to the stateful behavior. However, UDP is stateless and not a viable candidate for accomplishing the state negotiation outlined in [rfc3168]. To compensate for this stateless feature, [rtp-ecn] proposes utilizing this RTCP XR extension to provide for an RTP minimal congestion control functionality. By employing Extended RTP Profile for Real-time Transport Control Protocol (RTCP)-Based Feedback (RTP/AVPF) [RFC 4585], it is possible to provide suitable timely feedback at the level necessary for base-line congestion control mechanisms. This newly proposed XR follows the guidelines defined in [rfc3550] and [rfc3611].

3 RTCP Block Extended Report: ECN

This block type permits detailed reporting upon the ECN marking of individual packets. As detailed above the ECN marking may be employed in a variety of ways. The information may also be utilised by monitoring systems.

This reporting format utilises an approach closely aligned that in the Section 4.1 [rfc3611] Loss RLE report Block. The main difference with the ECN report block is that it reports both bits of the ECN field.
The reason for this is so that the ECN statistics may be complete, by conveying all three codepoints; Congestion Experienced (CE), ECN-Capable Transport (ECT), and Not-ECT.

The ECN Report Block has the following format:

```
0                   1                   2                   3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     BT=TBD    | rsvd. |   T   |         block length          |
|+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        SSRC of source                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          begin_seq            |             end_seq           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          chunk 1              |             chunk 2           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        ...                                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          chunk n-1            |             chunk n           |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

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

- **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. SDP Attribute

The use of SDP to signal XR blocks is specified in [RFC3611], which provides for ease of extension. This section defines such an extension to provide for signalling of the ECN report block.

An additional value, "ecn-rle", is defined for the existing "xr-format" parameter in RTCP XR attribute.

\[\text{rtcp-xr-attrib} = "a=\ "rtcp-xr\ "\" [xr-format *(SP xr-format)] CRLF\]

\text{(as defined in RFC3611)}

\text{xr-format = xr-format / ecn-rle}

\text{ecn-rle = "ecn-rle" ["=" max-size]}

5. IANA Considerations

This document creates a new block type within the IANA "RTCP XR Block Type Registry" called the ECN Metrics Block, and a new parameter \text{xr-ecn} within the "RTCP XR SDP Parameters Registry".

6. Security Considerations

The proposed RTCP XR report block introduces no new security considerations beyond those described in [RFC3611]. This block may provide per-packet statistics of downstream flows to the upstream source node.

7. References

7.1. Normative References


Applications", RFC 3550, IETF, July 2003


7.2 Informative References


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