Internet Engineering Task Force   Piers O'Hanlon
INTERNET DRAFT   UCL
June 29, 2009   Ken Carlberg
                                                    G11

              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 substitued for TCP.

1.1. Applicability

This metric is believed to be applicable to all RTP applications
which utilise ECN for congetsion 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.

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

(as defined in RFC3611)

xr-format = xr-format / ecn-rle

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 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

[rfc2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement
          Levels", BCP 14, RFC 2119, IETF, March 1997.

[rfc3550] Schulzrinne, S., et al, "RTP: A Transport Protocol for Real-Time

               Applications", RFC 3550, IETF, July 2003

     [rfc3611] Friedman, T., et al, "RTP Control Protocol Extended Reports
               (RTCP XR)", RFC 3611, IETF, November 2003

     [rfc4585] Ott, J., et al, "Extended RTP Profile for Real-time Transport
               Control Protocol (RTCP) -Based Feedback (RTP/AVPF)", RFC 4585,
               IETF, July 2006

7.2 Informative References

     [rtp-ecn] Carlberg, K., P. O'Hanlon, "Explicit Notification Extension (ECN)
               Extension for RTP", Internet Draft, Work in Progress, Jun 2009

     [rfc2481] Ramakrishnan, S., S. Floyd, "A Proposal to Add Explicit
Congestion
               Notification (ECN) to IP", RFC2481, IETF, January 1999

     [rfc3168] Ramakrishnan, S., et al, "The Addition of Explicit Congestion
               Notification (ECN) to IP", RFC3168, IETF, September 2001

Author's Addresses

   Piers O'Hanlon
   University College London
   Gower Street
   London, UK
   EMail: p.ohanlon@cs.ucl.ac.uk

   Ken Carlberg
   G11
   1601 Clarendon Blvd
   Arlington, VA, USA
   email: carlberg@g11.org.uk