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            RTCP XR for Summary Statistics Metrics Reporting
                 draft-zorn-xrblock-rtcp-xr-al-stat-03

Abstract

   This document defines three RTCP XR Report Blocks and associated SDP
   parameters that allows the reporting of loss, duplication and discard
   summary statistics metrics for use in a range of RTP applications.

Status of this Memo

   This Internet-Draft is submitted in full conformance with the
   provisions of BCP 78 and BCP 79.

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   and may be updated, replaced, or obsoleted by other documents at any
   time. It is inappropriate to use Internet-Drafts as reference
   material or to cite them other than as "work in progress."

   This Internet-Draft will expire on April 15, 2012.

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1. Introduction

   RFC 3611 [RFC3611] defines seven report block formats for network
   management and quality monitoring. However, some of these metrics
   are mostly for multicast inference of network characteristics (MINC)
   or voice over IP (VoIP) monitoring and not widely applicable to other
   applications, e.g., video quality monitoring. This document focuses
   on specifying new additional report block types used to convey loss,
   duplication and discard summary statistics that are generically
   designed for use in audio and video services.

   The metrics belong to both the class of application layer metrics and
   transport layer metrics defined in [MONARCH] (work in progress).

1.1. Applicability

   The Report Blocks defined in this document can be applied to any
   real-time applications that convey loss, duplication and discard
   summary statistics.

2. Terminology

2.1. Standards Language

   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].

   In addition, the following terms are defined:

   Picture Type

      Picture types used in the different video algorithms compose of
      the key-frame and the Derivation frame. Key-frame is also called
      a reference frame and used as a reference for predicting other
      pictures. It is coded without prediction from other pictures.
      The Derivation frame is derived from Key-frame using prediction
      from the reference frame.

3. Transport Layer Metrics

3.1. Burst/Gap Loss Summsary Statistics Block

   The metrics described here are intended to be used as described in
   this section, in conjunction with information from the Measurement

Information block (which MUST be present in the same RTCP packet as
the Burst/Gap Loss block) and also with the metric "cumulative number
of packets lost" provided in standard RTCP [RFC3550].

3.1.1. Report Block Structure

```
 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     |I|    rsv.     |            block length       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        SSRC of Source                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        Burst Loss Rate        |         Gap Loss Rate         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
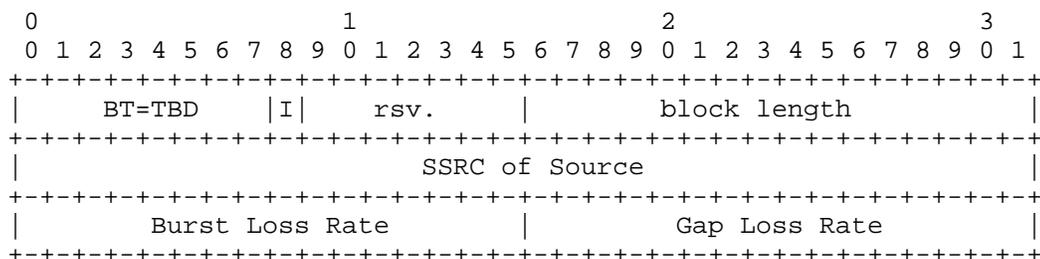
3.1.2. Definition of Fields in Loss Summary Statistics Block

   block type (BT): 8 bits

      Burst/Gap Loss Summsary Statistics Block is identified by the
      constant <BGLSS>.

   Interval Metric flag (I): 1 bit

      This field is used to indicate whether the metrics block is an
      Interval or a Cumulative report,

   reserved: 7 bits

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

   block length: 16 bits

      The constant 2, in accordance with the definition of this field in
      Section 3 of RFC 3611 [RFC3611].

   SSRC of source: 32 bits

      As defined in Section 4.1 of RFC3611 [RFC3611].

   Burst Loss Rate: 16 bits

      The fraction of packets lost during bursts since the beginning of
      reception, expressed as a fixed point number with the binary point
      at the left edge of the field. This value is calculated by

dividing Packets Discarded in Bursts by Total Packets expected in Bursts as follows:

Packets Loss in Bursts / Total Packets expected in Bursts

Gap Loss Rate: 16 bits

The fraction of packets lost during gaps since the beginning of reception expressed as a fixed point number with the binary point at the left edge of the field. This value is calculated by dividing the difference between number of packets lost and Packets lost in Bursts by the difference between Packets Expected and Total Packets expected in Bursts as follows:

(number of packets lost - Packets Lost in Bursts) / (Packets Expected - Total Packets expected in Bursts)

where "number of packets lost" is obtained from standard RTCP [RFC3550] and Packets Expected is calculated as the difference between "extended last sequence number" and "extended first sequence number" (Interval or Cumulative) provided in the Measurement Identity and Information block [MEASIDENT].

Note that if the metric is to be calculated on an Interval basis, a difference must be taken between the current and preceding values of "cumulative number of packets lost" in RTCP, to obtain the "number of packets lost" for the reporting interval.


3.2. Burst/Gap Discard Summary Statistics Block

The metrics described here are intended to be used as described in this section, in conjunction with information from the Measurement Identity block (which MUST be present in the same RTCP packet as the Burst/Gap Discard block) and also with the metric "number of packets discarded" provided in the RTCP XR Discard Block [DISCARD]. The RTCP XR Discard Block SHOULD be sent if the Burst/Gap Discard block is sent, but the converse does not apply.

3.2.1. Report Block Structure

```
 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     |I|    Rsv.    |           block length        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                        SSRC of Source                         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|       Burst Discard Rate      |       Gap Discard Rate        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|      Burst duration Mean      |    Burst duration Varianc     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
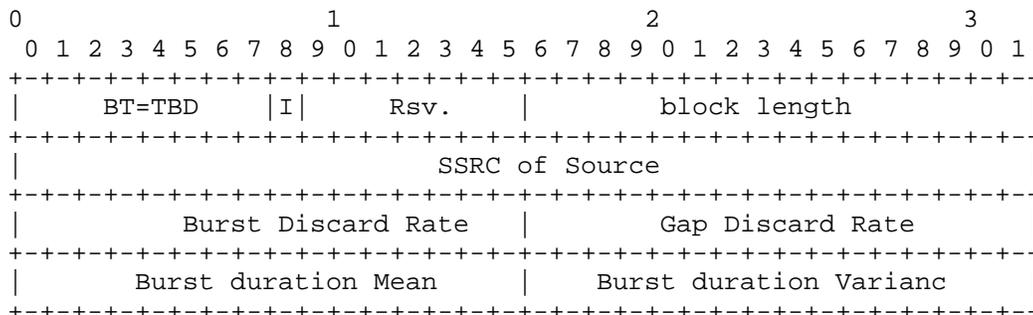
3.2.2. Definition of Fields in Discard Summary Statistics Block

   block type (BT): 8 bits

      Burst/Gap Discard Summary Statistics Block is identified by the
      constant <BGDSS>.

   reserved: 8 bits

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

   Interval Metric flag (I): 1 bit

      This field is used to indicate whether the metrics block is an
      Interval or a Cumulative report,

   reserved: 7 bits

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

   block length: 16 bits

      The constant 3, in accordance with the definition of this field in
      Section 3 of RFC 3611 [RFC3611].

   SSRC of source: 32 bits

      As defined in Section 4.1 of RFC3611 [RFC3611].

Burst Discard Rate: 16 bits

   The fraction of packets discarded during bursts since the
   beginning of reception, expressed as a fixed point number with the
   binary point at the left edge of the field. This value is
   calculated by dividing Packets Discarded in Bursts by Total
   Packets expected in Bursts as follows:

   Packets Discarded in Bursts / Total Packets expected in Bursts

Gap Discard Rate: 16 bits

   The fraction of packets discarded during gaps since the beginning
   of reception expressed as a fixed point number with the binary
   point at the left edge of the field. This value is calculated by
   dividing the difference between number of packets discarded and
   Packets Discarded in Bursts by the difference between Packets
   Expected and Total Packets expected in Bursts as follows:

   (number of packets discarded - Packets Discarded in Bursts) /
   (Packets Expected - Total Packets expected in Bursts)

   where "number of packets discarded" is obtained from the RTCP XR
   Discard Block [DISCARD] and Packets Expected is calculated as the
   difference between "extended last sequence number" and "extended
   first sequence number" (Interval or Cumulative) provided in the
   Measurement Information block [MEASIDENT].

Burst duration Mean:16bits

   The mean burst duration is obtained as the quotient:

   mean = Sum of Burst Durations / Number of Bursts

   where " Sum of Burst Durations " and "Number of Bursts"is obtained
   from the RTCP XR Burst/Gap Discard Block.

Burst Duration Variance:16bits

   The variance of the burst duration is obtained using the standard
   result:

   var = (Sum of Squares of Burst Durations - Number of Bursts *
   mean^2) / (Number of Bursts - 1)

   where " Sum of Squares of Burst Durations " and "Number of
   Bursts"is obtained from the RTCP XR Burst/Gap Discard Block.

4. Application Layer Metrics

4.1. Application Layer Loss/Duplication Statistics Summary Block

   This block reports statistics beyond the information carried in the
   Statistics Summary Report Block RTCP packet specified in the section
   4.6 of RFC 3611 [RFC3611]. Information is recorded about lost frames
   ,duplicated frames, lost partial frames. Such information can be
   useful for network management and video quality monitoring.

4.1.1. Report Block Structure

```
     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      | |T|P|   rsv.   |         block length        |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                        SSRC of Source                         |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |         begin_seq           |           end_seq               |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                    Number of frames expected                  |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                       lost_full_frames                        |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                          dup_frames                           |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                      lost_partial_frames                      |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
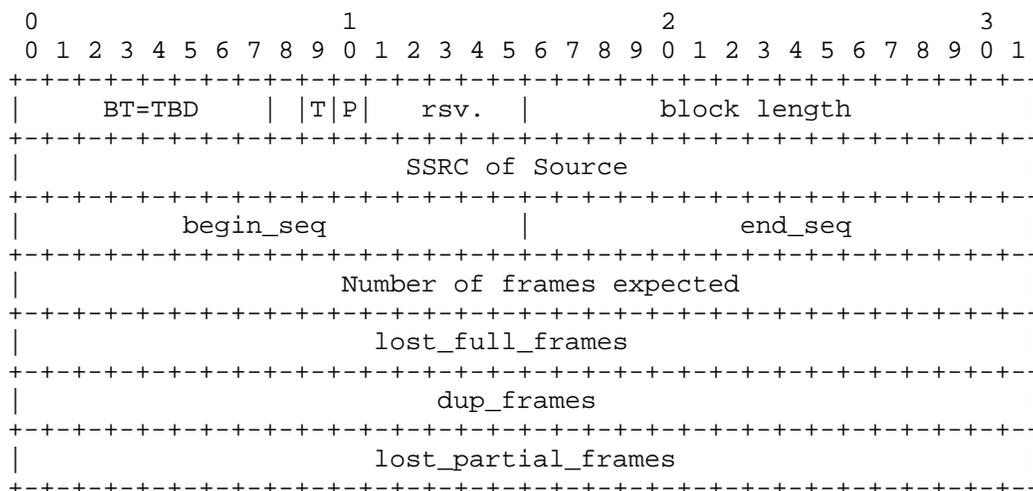
4.1.2. Definition of Fields in Loss/Duplication Summary Statistics
        Block

   Block type (BT): 8 bits

      Application Layer Loss/Duplication Statistics Summary Bloc is
      identified by the constant <ALDSS>.

   Picture type indicator (T): 1 bit

      Picture types used in the different video algorithms compose of
      key-frame and derivation frame. This field is used to indicate
      the frame type to be reported. Bits set to 0 if the lost_frames
      field or dup_frames field contain a key_frame report or reference
      frame report, 1 if the lost_frames field and dup_frames field
      contain other derivation frame report.

P: 1 bit

   Bit set to 1 if the partial_lost_frames field or the partial_dup_
   frames field contains a report, 0 otherwise.

Rsv.: 6 bits

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

Block length: 16 bits

   The constant 6, in accordance with the definition of this field in
   Section 3 of RFC 3611 [RFC3611].

SSRC of source: 32 bits

   As defined in Section 4.1 of RFC3611 [RFC3611].

begin_seq: 16 bits

   As defined in Section 4.1 of RFC 3611 [RFC3611].

end_seq: 16 bits

   As defined in Section 4.1 of RFC 3611 [RFC3611].

number of frames expected:32bits

   A count of the number of frames expected, estimated if necessary.
   If no frames have been received then this count shall be set to
   Zero.

lost_full_frames: 32 bits

   If one frame is completely lost, this frame is regarded as one
   lost full_frame. The lost_full_frames is equivalent to the number
   of lost_full_frames in the above sequence number interval.

dup_frames: 32 bits

   Number of dup_frames in the above sequence number interval.

lost_partial_frames: 32 bits

   If one frame is partially lost, this frame is regarded as one lost
   fractional frame. The lost_partial_frames is equivalent to the
   number of lost_partial_frames in the above sequence number
   interval.

5. SDP Signaling

   [RFC3611] defines the use of SDP (Session Description Protocol)
   [RFC4566] for signaling the use of XR blocks. XR blocks MAY be used
   without prior signaling.

   This section augments the SDP [RFC4566] attribute "rtcp-xr" defined
   in [RFC3611] by providing three additional value of "xr-format" to
   signal the use of the report block defined in this document.

```
       rtcp-xr-attrib =   "a=rtcp-xr:"
                          [xr-format *(SP xr-format)] CRLF
            xr-format =
                          / burst-gap-loss-stat
                          / burst-gap-discard-stat
                          / application-loss-dup-stat
```

   Refer to Section 5.1 of RFC 3611 [RFC3611] for a detailed description
   and the full syntax of the "rtcp-xr" attribute.

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 values

   This document assigns three new block type value in the RTCP XR Block
   Type Registry:

         Name: BGLSS
         Long Name: Burst/Gap Loss Summsary Statistics Block
         Value   <BGLSS>
         Reference: Section 5.1

         Name: BGDSS
         Long Name: Burst/Gap Discard Summary Statistics Block
         Value   <BGDSS>
         Reference: Section 5.2

         Name: ALDSS
         Long Name: Application Layer Loss/Duplication Statistics Summary
         Value   <ALDSS>
         Reference: Section 6.1

6.2. New RTCP XR SDP Parameters

   This document also registers three new SDP [RFC4566] parameters for
   the "rtcp-xr" attribute in the RTCP XR SDP Parameters Registry:

   * " burst-gap-loss-stat "
   * " burst-gap-discard-stat "
   * "application-loss-dup-stat "

6.3. Contact information for registrations

   The contact information for the registrations is:

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7. Security Considerations

   The new RTCP XR report blocks proposed in this document introduces no
   new security considerations beyond those described in [RFC3611].

8. Acknowledgements

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   Begen,Colin Perkins, Roni Even,Youqing Yang, Wenxiao Yu and Yinliang
   Hu for their valuable comments and suggestions on this document.

9. References

9.1. Normative References

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9.2. Informative References

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Appendix A. Change Log

   This document is separated from
   draft-wu-xrblock-rtcp-xr-quality-monitoring-01 with a few editorial
   changes and focuses on loss,duplication, discard, and summary
   statistics metrics.

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