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RTCP XR Report Block for Concealment metrics Reporting on Audio Applications
draft-ietf-xrblock-rtcp-xr-loss-conceal-11.txt

Abstract

   This document defines two RTCP XR Report Blocks that allows the
   reporting of concealment metrics for audio applications of RTP.

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   provisions of BCP 78 and BCP 79.

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1. Introduction

1.1. Loss Concealment and Concealment Seconds Metrics Reporting Block

At any instant, the audio output at a receiver may be classified as
either 'normal' or 'concealed'. 'Normal' refers to playout of audio
payload received from the remote end, and also includes locally
generated signals such as announcements, tones and comfort noise.
Concealment refers to playout of locally-generated signals used to
mask the impact of network impairments or to reduce the audibility of
jitter buffer adaptations.

This draft defines two new concealment related block types to augment
those defined in [RFC3611] for use in a range of RTP applications.
These two block types extend packet loss concealment mechanism
defined in section 4.7.6 of RFC3611.

The first block type provides metrics for actions taken by the
receiver to mitigate the effect of packet loss and packet discard.
Specifically, the first metric (On-Time Playout Duration) reports the
duration of normal playout of data which the receiver obtained from
the sender's stream. A second metric (Loss Concealment Duration)
reports the total time during which the receiver played out media
data which was manufactured locally, because the sender's data for
these periods was not available due to packet loss or discard. A
similar metric (Buffer Adjustment Concealment Duration) reports the
duration of playout of locally-manufactured data replacing data which
is unavailable due to adaptation of an adaptive de-jitter buffer.
Further metrics (Playout Interrupt Count and Mean Playout Interrupt
Size) report the number of times normal playout was interrupted, and
the mean duration of these interruptions.

Loss Concealment Duration and Buffer Adjustment Concealment Duration
are reported separately because buffer adjustment is typically
arranged to occur in silence periods so may have very little impact
on user experience, whilst loss concealment may occur at any time.

The second block type provides metrics for concealment seconds, which
are measured at the receiving end of the RTP stream. Specifically,
the first metric (Unimpaired Seconds) reports the number of whole
seconds occupied only with normal playout of data which the receiver
obtained from the sender's stream. The second metric (Concealed
Seconds) reports the number of whole seconds during which the
receiver played out any locally-generated media data. A third
metric, Severely Concealed Seconds (SCS), reports the number of whole
seconds during which the receiver played out locally-generated data
for more than SCS Threshold.

These metrics belongs to the class of transport-related terminal
metrics defined in [RFC6792].

1.2. RTCP and RTCP XR Reports

The use of RTCP for reporting is defined in [RFC3550]. [RFC3611]
defined an extensible structure for reporting using an RTCP Extended
Report (XR). This draft defines a new Extended Report block that
MUST be used as defined in [RFC3550] and [RFC3611].

1.3. Performance Metrics Framework

The Performance Metrics Framework [RFC6390] provides guidance on the
definition and specification of performance metrics. The RTP
Monitoring Architectures [RFC6792] provides guideline for reporting
block format using RTCP XR. The Metrics Block described in this
document are in accordance with those guidelines.

1.4. Applicability

These metrics are applicable to audio applications of RTP and the
audio component of Audio/Video applications in which the packet loss
concealment machinery is contained at the receiving end to mitigate
the impact of network impairments to user's perception of media
quality.

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 RFC2119 [RFC2119].

2.2. Notations

   This report block makes use of binary fractions. The terminology
   used is

      Numeric formats S X:Y

         where S indicates a two's complement signed representation, X
         the number of bits prior to the decimal place and Y the number
         of bits after the decimal place.

         Hence 8:8 represents an unsigned number in the range 0.0 to
         255.996 with a granularity of 0.0039. S7:8 would represent the
         range -127.996 to +127.996. 0:16 represents a proper binary
         fraction with range

         0.0 to 1 - 1/65536 = 0.9999847

         though note that use of flag values at the top of the numeric
         range slightly reduces this upper limit. For example, if the
         16- bit values 0xfffe and 0xffff are used as flags for "over-
         range" and "unavailable" conditions, a 0:16 quantity has range

         0.0 to 1 - 3/65536 = 0.9999542

3. Loss Concealment Block

The metrics block described here are intended to be used as described
in this section, in conjunction with information from the Measurement
Information block [RFC6776]. Instances of this Metrics Block refer
by Synchronization source (SSRC) to the separate auxiliary
Measurement Information block [RFC6776] which describes measurement
periods in use (see [RFC6776] section 4.2). This Metrics Block
relies on the measurement period in the Measurement Information block
indicating the span of the report and SHOULD be sent in the same
compound RTCP packet as the measurement information block. If the
measurement period is not received in the same compound RTCP packet
as this Metrics Block, this metrics block MUST be discarded.

3.1. Report Block Structure

Loss Concealment Metrics Block

```
    0                   1                   2                   3
    0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7 0 1 2 3 4 5 6 7
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |    BT=NLC     | I |plc|  rsv. |          block length=5        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                       SSRC of Source                          |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                    On-time Playout Duration                   |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                    Loss Concealment Duration                  |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                Buffer Adjustment Concealment Duration         |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |    Playout Interrupt Count    |            Reserved.           |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                    Mean Playout Interrupt Size                |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
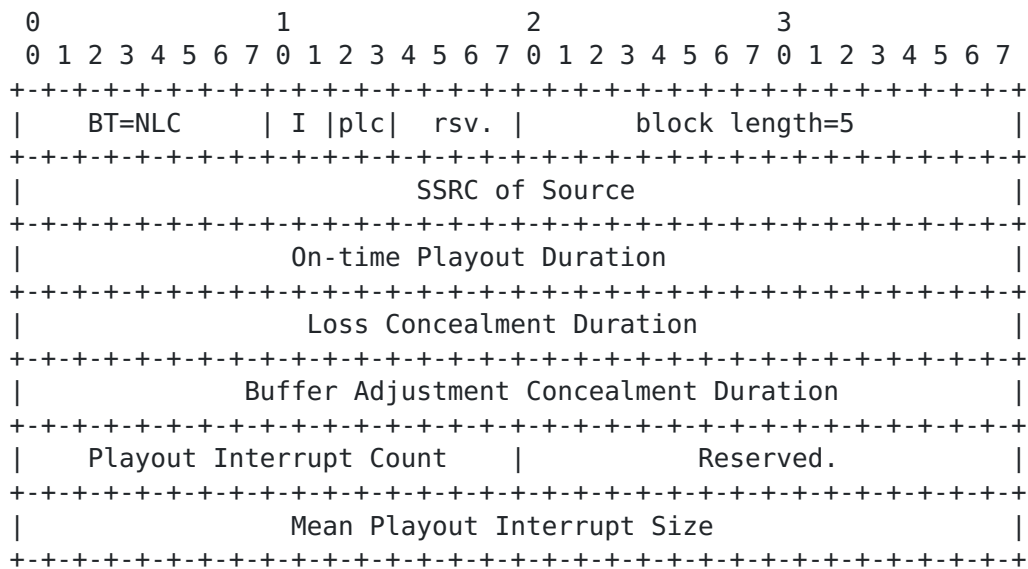
Figure 1: Report Block Structure

3.2. Definition of Fields in Loss Concealment Metrics Block

Block type (BT): 8 bits

A Loss Concealment Metrics Report Block is identified by the
constant NLC.

[Note to RFC Editor: please replace NLC with the IANA provided
RTCP XR block type for this block.]

Interval Metric flag (I): 2 bit

    This field is used to indicate whether the Loss Concealment
    metrics are Sampled, Interval or Cumulative metrics:

       I=10: Interval Duration - the reported value applies to the
       most recent measurement interval duration between successive
       metrics reports.

       I=11: Cumulative Duration - the reported value applies to the
       accumulation period characteristic of cumulative measurements.

       I=01: Sampled Value - the reported value is a sampled
       instantaneous value (Not allowed in this block).

       I=00: Reserved value- this value is reserved for future use.

    In this document, Loss Concealment Metrics can only be measured
    over definite intervals, and cannot be sampled. Senders MUST NOT
    use the values I=00 or I=01. If a block is received with I=00 or
    I=01, the receiver MUST discard the block.

Packet Loss Concealment Method (plc): 2 bits

    This field is used to identify the packet loss concealment method
    in use at the receiver, according to the following code:

       bits 014-015

          0 = silence insertion

          1 = simple replay, no attenuation

          2 = simple replay, with attenuation

          3 = enhancement

       Other values reserved

    Note that the enhancement method (plc =3) for packet loss
    concealment offers an improved audio quality and a better
    robustness against packet losses [G.711] and is equivalent to
    enhanced in section 4.7.6 of [RFC3611].

Reserved (resv): 4 bits

   These bits are reserved. They MUST be set to zero by senders and
   ignored by receivers (See [RFC6709] section 4.2).

block length: 16 bits

   The length of this report block in 32-bit words, minus one. For
   the Loss Concealment Block, the block length is equal to 5.

SSRC of source: 32 bits

   As defined in Section 4.1 of [RFC3611].

On-time Playout Duration: 32 bits

   'On-time' playout is the uninterrupted, in-sequence playout of
   valid decoded audio information originating from the remote
   endpoint. This includes comfort noise during periods of remote
   talker silence, if VAD [VAD] is used, and locally generated or
   regenerated tones and announcements.

   An equivalent definition is that on-time playout is playout of any
   signal other than those used for concealment.

   On-time playout duration is expressed in units of RTP timestamp
   and MUST include both speech and silence intervals, whether VAD is
   used or not.

   If the measured value exceeds 0xFFFFFFFD, the value 0xFFFFFFFE
   MUST be reported to indicate an over-range measurement. If the
   measurement is unavailable, the value 0xFFFFFFFF MUST be reported.

Loss Concealment Duration: 32 bits

   The duration, expressed in units of RTP timestamp, of audio
   playout corresponding to Loss-type concealment.

   Loss-type concealment is reactive insertion or deletion of samples
   in the audio playout stream due to effective frame loss at the
   audio decoder. "Effective frame loss" is the event in which a
   frame of coded audio is simply not present at the audio decoder
   when required. In this case, substitute audio samples are
   generally formed, at the decoder or elsewhere, to reduce audible

impairment.

If the measured value exceeds 0xFFFFFFFD, the value 0xFFFFFFFE
MUST be reported to indicate an over-range measurement. If the
measurement is unavailable, the value 0xFFFFFFFF MUST be reported.

Buffer Adjustment Concealment Duration: 32 bits

The duration, expressed in units of RTP timestamp, of audio
playout corresponding to Buffer Adjustment-type concealment, if
known.

If the measured value exceeds 0xFFFFFFFD, the value 0xFFFFFFFE
MUST be reported to indicate an over-range measurement. If the
measurement is unavailable, the value 0xFFFFFFFF MUST be reported.

Buffer Adjustment-type concealment is proactive or controlled
insertion or deletion of samples in the audio playout stream due
to jitter buffer adaptation, re-sizing or re-centering decisions
within the endpoint.

Because this insertion is controlled, rather than occurring
randomly in response to losses, it is typically less audible than
loss-type concealment. For example, jitter buffer adaptation
events may be constrained to occur during periods of talker
silence, in which case only silence duration is affected, or
sophisticated time-stretching methods for insertion/deletion
during favorable periods in active speech may be employed.

Concealment events which cannot be classified as Buffer
Adjustment-type MUST be classified as Loss-type.

Playout Interrupt Count: 16 bits

The number of interruptions to normal playout which occurred
during the reporting period.

If the measured value exceeds 0xFFFD, the value 0xFFFE MUST be
reported to indicate an over-range measurement. If the
measurement is unavailable, the value 0xFFFF MUST be reported.

Reserved (resv): 16 bits

These bits are reserved. They MUST be set to zero by senders and
ignored by receivers (See [RFC6709] section 4.2).

   Mean Playout Interrupt Size: 32 bits

      The mean duration, expressed in units of RTP timestamp, of
      interruptions to normal playout which occurred during the
      reporting period.

      If the measured value exceeds 0xFFFD, the value 0xFFFE MUST be
      reported to indicate an over-range measurement. If the
      measurement is unavailable, the value 0xFFFF MUST be reported.

4. Concealment Seconds Block

   This sub-block described here is intended to be used as described in
   this section, in conjunction with information from the Measurement
   Information block [RFC6776] and provides a description of potentially
   audible impairments due to lost and discarded packets at the
   endpoint, expressed on a time basis analogous to a traditional PSTN
   T1/E1 errored seconds metric. Instances of this Metrics Block refer
   by Synchronization source (SSRC) to the separate auxiliary
   Measurement Information block [RFC6776] which describes measurement
   periods in use (see [RFC6776] section 4.2). This Metrics Block
   relies on the measurement period in the Measurement Information block
   indicating the span of the report and SHOULD be sent in the same
   compound RTCP packet as the measurement information block. If the
   measurement period is not received in the same compound RTCP packet
   as this Metrics Block, this metrics block MUST be discarded.

   The following metrics are based on successive one second intervals as
   declared by a RTP clock. This RTP clock does not need to be
   synchronized to any external time reference. The starting time of
   this clock is unspecified. Note that this implies that the same loss
   pattern could result in slightly different count values, depending on
   where the losses occur relative to the particular one-second
   demarcation points. For example, two loss events occurring 50ms
   apart could result in either one concealed second or two, depending
   on the particular one second boundaries used.

   The seconds in this sub-block are not necessarily calendar seconds.
   At the tail end of a session, periods of time of less than one second
   shall be incorporated into these counts if they exceed 500ms and
   shall be disregarded if they are less than 500ms.

4.1. Report Block Structure

   Concealed Seconds Metrics Block

```
     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=NCS     | I |plc|Rserved|        block length=4         |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                       SSRC of Source                          |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                     Unimpaired Seconds                        |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                     Concealed Seconds                         |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    | Severely Concealed Seconds    | RESERVED      | SCS Threshold |
```

```
      +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
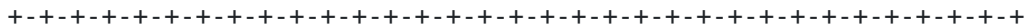
Figure 2: Report Block Structure

[4.2](). Definition of Fields in Concealed Seconds Metrics Block

   Block type (BT): 8 bits

      A Concealed Seconds Metrics Report Block is identified by the
      constant NCS.

      [Note to RFC Editor: please replace NCS with the IANA provided
      RTCP XR block type for this block.]

   Interval Metric flag (I): 2 bit

      This field is used to indicate whether the Concealment Seconds
      Metrics are Sampled, Interval or Cumulative metrics:

         I=10: Interval Duration - the reported value applies to the
         most recent measurement interval duration between successive
         metrics reports.

         I=11: Cumulative Duration - the reported value applies to the
         accumulation period characteristic of cumulative measurements.

         I=01: Sampled Value - the reported value is a sampled
         instantaneous value (Not allowed in this block).

         I=00: Reserved value- this value is reserved for future use.

      In this document, Concealment Seconds Metrics can only be measured
      over definite intervals, and cannot be sampled. Senders MUST NOT
      use the values I=00 or I=01. If a block is received with I=00 or
      I=01, the receiver MUST discard the block.

   Packet Loss Concealment Method (plc): 2 bits

      This field is used to identify the packet loss concealment method
      in use at the receiver, according to the following code:

         bits 014-015

            0 = silence insertion

            1 = simple replay, no attenuation

            2 = simple replay, with attenuation

            3 = enhancement

            Other values reserved

    Note that the enhancement method (plc =3) for packet loss
    concealment offers an improved audio quality and a better
    robustness against packet losses [G.711] and is equivalent to
    enhanced in section 4.7.6 of [RFC3611].

  Reserved (resv): 4 bits

    These bits are reserved. They MUST be set to zero by senders and
    ignored by receivers (See [RFC6709] section 4.2).

  Block Length: 16 bits

    The length of this report block in 32-bit words, minus one. For
    the Concealment Seconds Block, the block length is equal to 4.

  SSRC of source: 32 bits

    As defined in Section 4.1 of [RFC3611].

  Unimpaired Seconds: 32 bits

    A count of the number of unimpaired Seconds that have occurred.

    An unimpaired Second is defined as a continuous period of one
    second during which no frame loss or discard due to late arrival
    has occurred. Every second in a session must be classified as
    either OK or Concealed.

    Normal playout of comfort noise or other silence concealment
    signal during periods of talker silence, if VAD is used, shall be
    counted as unimpaired seconds.

If the measured value exceeds 0xFFFFFFFD, the value 0xFFFFFFFE
MUST be reported to indicate an over-range measurement. If the
measurement is unavailable, the value 0xFFFFFFFF MUST be reported.

Concealed Seconds: 32 bits

A count of the number of Concealed Seconds that have occurred.

A Concealed Second is defined as a continuous period of one second
during which any frame loss or discard due to late arrival has
occurred.

Equivalently, a concealed second is one in which some Loss-type
concealment has occurred. Buffer adjustment-type concealment
SHOULD NOT cause Concealed Seconds to be incremented, with the
following exception. An implementation MAY cause Concealed
Seconds to be incremented for 'emergency' buffer adjustments made
during talkspurts.

Loss-type concealment is reactive insertion or deletion of samples
in the audio playout stream due to effective frame loss at the
audio decoder. "Effective frame loss" is the event in which a
frame of coded audio is simply not present at the audio decoder
when required. In this case, substitute audio samples are
generally formed, at the decoder or elsewhere, to reduce audible
impairment.

Buffer Adjustment-type concealment is proactive or controlled
insertion or deletion of samples in the audio playout stream due
to jitter buffer adaptation, re-sizing or re-centering decisions
within the endpoint.

Because this insertion is controlled, rather than occurring
randomly in response to losses, it is typically less audible than
loss-type concealment. For example, jitter buffer adaptation
events may be constrained to occur during periods of talker
silence, in which case only silence duration is affected, or
sophisticated time-stretching methods for insertion/deletion
during favorable periods in active speech may be employed. For
these reasons, buffer adjustment-type concealment MAY be exempted
from inclusion in calculations of Concealed Seconds and Severely
Concealed Seconds.

However, an implementation SHOULD include buffer-type concealment
in counts of Concealed Seconds and Severely Concealed Seconds if
the event occurs at an 'inopportune' moment, with an emergency or
large, immediate adaptation during active speech, or for

unsophisticated adaptation during speech without regard for the
underlying signal, in which cases the assumption of low-audibility
cannot hold. In other words, jitter buffer adaptation events
which may be presumed to be audible SHOULD be included in
Concealed Seconds and Severely Concealed Seconds counts.

Concealment events which cannot be classified as Buffer
Adjustment- type MUST be classified as Loss-type.

For clarification, the count of Concealed Seconds MUST include the
count of Severely Concealed Seconds.

If the measured value exceeds 0xFFFFFFFD, the value 0xFFFFFFFE
MUST be reported to indicate an over-range measurement. If the
measurement is unavailable, the value 0xFFFFFFFF MUST be reported.

Severely Concealed Seconds: 16 bits

A count of the number of Severely Concealed Seconds.

A Severely Concealed Second is defined as a non-overlapping period
of one second during which the cumulative amount of time that has
been subject to frame loss or discard due to late arrival, exceeds
the SCS Threshold.

If the measured value exceeds 0xFFFD, the value 0xFFFE MUST be
reported to indicate an over-range measurement. If the
measurement is unavailable, the value 0xFFFF MUST be reported.

Reserved: 8 bits

These bits are reserved. They MUST be set to zero by senders and
ignored by receivers (See [RFC6709] section 4.2).

SCS Threshold: 8 bits

The SCS Threshold is defined as the percentage of packets
corresponding to lost or discarded frames that must occur within a
one second period in order for the second to be classified as a
Severely Concealed Second. This is expressed in numeric format
0:8 and hence can represent a range of 0 to 99.6 percent loss or
discard.

A default threshold of 5% effective frame loss (50ms effective
frame loss) per second is suggested. This corresponds to an SCS
Threshold in hexadecimal of 0x0D.

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.

5.1. SDP rtcp-xr-attrib Attribute Extension

   This section augments the SDP attribute "rtcp-xr" [RFC3611] by
   providing two additional values of "xr-format" to signal the use of
   two report blocks defined in this document.

   xr-format =/ xr-conceal-block
             / xr-conc-sec-block

   xr-conceal-block = "loss-conceal"
   xr-conc-sec-block = "conc-sec" ["=" thresh]

   thresh   = 1*DIGIT   ; threshold for SCS (ms)
   DIGIT   = %x30-39

5.2. Offer/Answer Usage

   When SDP is used in offer-answer context, the SDP Offer/Answer usage
   defined in [RFC3611] applies. Note that "thresh" is declared by the
   offer.

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 two block type values in the IANA "RTP Control
Protocol Extended Reports (RTCP XR) Block Type Registry ":

```
Name:        LCB
Long Name:   Loss Concealment Block
Value        <NLC>
Reference:   Section 3.1

Name:        CSB
Long Name:   Concealment Seconds Block
Value        <NCS>
Reference:   Section 4.1
```

[Note to RFC Editor: please replace <NLC> and <NCS> with the RTCP XR
block type assigned by IANA for this block.]

6.2. New RTCP XR SDP Parameters

This document also registers two new parameters in the "RTP Control
Protocol Extended Reports (RTCP XR) Session Description Protocol
(SDP) Parameters Registry":

o "loss-conceal"

o "conc-sec"

6.3. Contact information for registrations

The contact information for the registrations is:

RAI Area Directors

rai-ads@tools.ietf.org

7. Security Considerations

   It is believed that this proposed RTCP XR report block introduces no
   new security considerations beyond those described in [RFC3611].
   This block does not provide per-packet statistics so the risk to
   confidentiality documented in Section 7, paragraph 3 of [RFC3611]
   does not apply.

8. Contributors

   Geoff Hunt wrote the initial draft of this document.

9. Acknowledgements

[10](). References

[10.1](). Normative References

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

[RFC3550]   Schulzrinne, H., "RTP: A Transport Protocol for Real-Time
            Applications", [RFC 3550](), July 2003.

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

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

[RFC6776]   Wu, Q., "Measurement Identity and information Reporting
            using SDES item and XR Block", [RFC 6776](), August 2012.

[10.2](). Informative References

[RFC6390]   Clark, A. and B. Claise, "Framework for Performance Metric
            Development", [RFC 6390](), October 2011.

[RFC6709]   Carpenter, B., Aboba, B., and S. Cheshire, "Design
            Considerations for Protocol Extensions", [RFC 6709](),
            September 2012.

[RFC6792]   Hunt, G., "Monitoring Architectures for RTP", [RFC 6792](),
            November 2012.

[VAD]   "http://en.wikipedia.org/wiki/Voice_activity_detection".

Appendix A. Metrics represented using RFC6390 Template

   RFC EDITOR NOTE: please change XXXX in [RFCXXXX] by the new RFC
   number, when assigned.

   a. On-time Playout Duration Metric

       * Metric Name: On-time Playout Duration

       * Metric Description: 'On-time' playout is the uninterrupted,
          in-sequence playout of valid decoded audio information
          originating from the remote endpoint. On-time playout
          Duration is playout duration of any signal other than those
          used for concealment

       * Method of Measurement or Calculation: See section 3. 2, On-
          time Playout Duration definition [RFCXXXX].

       * Units of Measurement: See section 3.2, On-time Playout
          Duration definition [RFCXXXX].

       * Measurement Point(s) with Potential Measurement Domain: See
          section 1.1, 3rd paragraph [RFCXXXX].

       * Measurement Timing: See section 3, 1st paragraph [RFCXXXX] for
          measurement timing and section 3.2 [RFCXXXX] for Interval
          Metric flag.

       * Use and applications: See section 1.4 [RFCXXXX].

       * Reporting model: See RFC3611.

   b. Loss Concealment Duration Metric

       * Metric Name: Loss Concealment Duration

       * Metric Description: The duration of audio playout
          corresponding to Loss-type concealment.

       * Method of Measurement or Calculation: See section 3.2, Loss
          Concealment Duration definition [RFCXXXX].

       * Units of Measurement: See section 3.2, Loss Concealment
          Duration definition [RFCXXXX].

       * Measurement Point(s) with Potential Measurement Domain: See
          section 1.1, 3rd paragraph [RFCXXXX].

       * Measurement Timing: See section 3, 1st paragraph [RFCXXXX] for
          measurement timing and section 3. 2 [RFCXXXX] for Interval
          Metric flag.

       * Use and applications: See section 1.4 [RFCXXXX].

       * Reporting model: See RFC3611.

   c. Buffer Adjustment Concealment Duration Metric

       * Metric Name: Buffer Adjustment Concealment Duration

       * Metric Description: The duration of audio playout
          corresponding to Buffer Adjustment-type concealment.

       * Method of Measurement or Calculation: See section 3. 2, Buffer
          Adjustment Concealment Duration definition [RFCXXXX].

       * Units of Measurement: See section 3.2, Buffer Adjustment
          Concealment Duration definition [RFCXXXX].

       * Measurement Point(s) with Potential Measurement Domain: See
          section 1.1, 3rd paragraph [RFCXXXX].

   * Measurement Timing: See section 3, 1st paragraph [RFCXXXX] for
     measurement timing and section 3.2 [RFCXXXX] for Interval
     Metric flag.

   * Use and applications: See section 1.4 [RFCXXXX].

   * Reporting model: See RFC3611.

   d. Playout Interrupt Count Metric

   * Metric Name: Playout Interrupt Count

   * Metric Description: The number of interruptions to normal
     playout which occurred during the reporting period.

   * Method of Measurement or Calculation: See section 3. 2,
     Playout Interrupt Count definition [RFCXXXX].

   * Units of Measurement: See section 3.2, Playout Interrupt Count
     definition [RFCXXXX].

   * Measurement Point(s) with Potential Measurement Domain: See
     section 1.1, 3rd paragraph [RFCXXXX].

   * Measurement Timing: See section 3, 1st paragraph [RFCXXXX] for
     measurement timing and section 3.2 [RFCXXXX] for Interval
     Metric flag.

   * Use and applications: See section 1.4 [RFCXXXX].

   * Reporting model: See RFC3611.

   e. Mean Playout Interrupt Size Metric

* Metric Name: Mean Playout Interrupt Size

* Metric Description: The mean duration of interruptions to
  normal playout which occurred during the reporting period.

* Method of Measurement or Calculation: See section 3. 2,
  Playout Interrupt Count definition [RFCXXXX].

* Units of Measurement: See section 3.2, Playout Interrupt Count
  definition [RFCXXXX].

* Measurement Point(s) with Potential Measurement Domain: See
  section 1.1, 3rd paragraph [RFCXXXX].

* Measurement Timing: See section 3, 1st paragraph [RFCXXXX] for
  measurement timing and section 3.2 [RFCXXXX] for Interval
  Metric flag.

* Use and applications: See section 1.4 [RFCXXXX].

* Reporting model: See RFC3611.

f. Unimpaired Seconds Metric

* Metric Name: Unimpaired Seconds

* Metric Description: A count of the number of unimpaired
  Seconds that have occurred.

* Method of Measurement or Calculation: See section 4. 2,
  Unimpaired Seconds definition [RFCXXXX].

* Units of Measurement: See section 4.2, Unimpaired Seconds
  definition [RFCXXXX].

        * Measurement Point(s) with Potential Measurement Domain: See
           section 1.1, 5th paragraph [RFCXXXX].

        * Measurement Timing: See section 4, 1st paragraph [RFCXXXX] for
           measurement timing and section 4.2 paragraph [RFCXXXX] for
           Interval Metric flag.

        * Use and applications: See section 1.4 [RFCXXXX].

        * Reporting model: See RFC3611.

   g. Concealed Seconds Metric

        * Metric Name: Concealed Seconds

        * Metric Description: A count of the number of Concealed Seconds
           that have occurred.

        * Method of Measurement or Calculation: See section 4. 2,
           Concealed Seconds definition [RFCXXXX].

        * Units of Measurement: See section 4.2, Concealed Seconds
           definition [RFCXXXX].

        * Measurement Point(s) with Potential Measurement Domain: See
           section 1.1, 5th paragraph [RFCXXXX].

        * Measurement Timing: See section 4, 1st paragraph [RFCXXXX] for
           measurement timing and section 4.2 [RFCXXXX] for Interval
           Metric flag.

        * Use and applications: See section 1.4 [RFCXXXX].

        * Reporting model: See RFC3611.

   h. Severely Concealed Seconds Metric

       * Metric Name: Severely Concealed Seconds

       * Metric Description: A count of the number of Severely
          Concealed Seconds that have occurred.

       * Method of Measurement or Calculation: See section 4. 2,
          Severely Concealed Seconds definition [RFCXXXX].

       * Units of Measurement: See section 4.2, Severely Concealed
          Seconds definition [RFCXXXX].

       * Measurement Point(s) with Potential Measurement Domain: See
          section 1.1, 5th paragraph [RFCXXXX].

       * Measurement Timing: See section 4, 1st paragraph [RFCXXXX] for
          measurement timing and section 4.2 [RFCXXXX] for Interval
          Metric flag.

       * Use and applications: See section 1.4 [RFCXXXX].

       * Reporting model: See RFC3611.

   i. SCS Threshold Metric

       * Metric Name: SCS Threshold

       * Metric Description: The amount of time corresponding to lost
          or discarded frames that must occur within a one second period
          in order for the second to be classified as a Severely
          Concealed Second.

       * Method of Measurement or Calculation: See section 4. 2, SCS
          Threshold definition [RFCXXXX].

   * Units of Measurement: See section 4.2, SCS Threshold
      definition [RFCXXXX].

   * Measurement Point(s) with Potential Measurement Domain: See
      section 1.1, 5th paragraph [RFCXXXX].

   * Measurement Timing: See section 4, 1st paragraph [RFCXXXX] for
      measurement timing and section 4.2 [RFCXXXX] for Interval
      Metric flag.

   * Use and applications: See section 1.4 [RFCXXXX].

   * Reporting model: See RFC3611.

Appendix B. Change Log

   Note to the RFC-Editor: please remove this section prior to
   publication as an RFC.

B.1. draft-ietf-xrblock-rtcp-xr-loss-conceal-11

   The following are the major changes to previous version :

   o Address comments recieved in Gen-Art Review and OPS-DIR Review.

B.2. draft-ietf-xrblock-rtcp-xr-loss-conceal-09

   The following are the major changes to previous version :

   o Only Version Number changes.

B.3. draft-ietf-xrblock-rtcp-xr-loss-conceal-07

   The following are the major changes to previous version :

   o Change units for threshold and units used for reporting in loss
      concealment block and concealment seconds block.

   o Change 16bit "Mean Playout Interrupt Size" into 32bits.

B.4. draft-ietf-xrblock-rtcp-xr-loss-conceal-06

   The following are the major changes to previous version :

   o Comments in the WGLC are addressed in this version.

B.5. draft-ietf-xrblock-rtcp-xr-loss-conceal-05

   The following are the major changes to previous version :

   o Add text to clarify the definition of enhanced method.

   o Add appendix to apply RFC6390 template to the metrics.

B.6. draft-ietf-xrblock-rtcp-xr-loss-conceal-04

   The following are the major changes to previous version :

   o Merge Concealment Seconds draft into this draft (i.e.,Loss
      Concealment draft).

   o Updated references.

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