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### RTCP XR Report Block for Loss Concealment Metric Reporting
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Abstract

   This document defines an RTCP XR Report Block that allows the
   reporting of Loss Concealment metrics primarily for audio
   applications of RTP.

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## 1.  Introduction

### 1.1.  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].

### 1.2.  Loss Concealment Report Block

This draft defines a new block type to augment those defined in
Friedman, et al. [RFC3611] for use in a range of RTP applications.

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.

The new 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 metric belongs to the class of transport-related terminal metrics
defined in Wu, et al. [I-D.ietf-avtcore-monarch].

### 1.3.  RTCP and RTCP XR Reports

The use of RTCP for reporting is defined in Schulzrinne, et
al. [RFC3550].  Friedman, Cacares & Clark [RFC3611] define 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 RFC 3550 and RFC 3611.

## 1.4.  Performance Metrics Framework

Clark & Claise [RFC6390] provides guidance on the definition and
specification of performance metrics.  Wu, et
al. [I-D.ietf-avtcore-monarch] provides guidelines for RTCP XR report
block formats.  The report block defined in this document is in
accordance with those guidelines.

## 1.5.  Applicability

This metric is primarily applicable to audio applications of RTP.
EDITOR'S NOTE: are there metrics for concealment of transport errors
for video?

## 2.  Loss Concealment Block

## 2.1.  Report Block Structure

```
    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    |   Mean Playout Interrupt Size |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
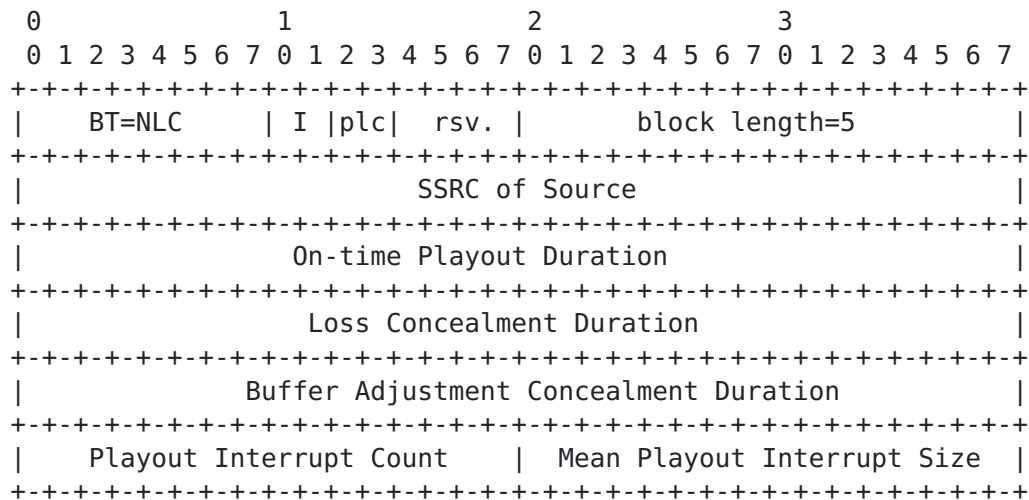
        Figure 1: Structure of the Loss Concealment Metrics Block

## 2.2.  Definition of Fields in Loss Concealment Report 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 Delay metrics are
      Sampled, Interval or Cumulative metrics, that is, whether the
      reported values applies to the most recent measurement interval
      duration between successive metrics reports (I=10) (the Interval
      Duration) or to the accumulation period characteristic of
      cumulative measurements (I=11) (the Cumulative Duration) or is a
      sampled instantaneous value (I=01) (Sampled Value).


   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 = enhanced

            Other values reserved


   Reserved (resv): 4 bits

      These bits are reserved.  They SHOULD be set to zero by senders
      and MUST be ignored by receivers.


   block length: 16 bits

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

SSRC of source: 32 bits

   As defined in Section 4.1 of RFC 3611.


On-time Playout Duration (ms): 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 voice activity detection (VAD) is in use, 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 MUST include both speech and silence
   intervals, whether VAD is used or not.  This duration is reported
   in millisecond units.

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


Loss Concealment Duration (ms): 32 bits

   The duration, in milliseconds, 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
   SHOULD be reported to indicate an over-range measurement.  If the
   measurement is unavailable, the value 0xFFFFFFFF SHOULD be
   reported.

   Buffer Adjustment Concealment Duration (ms): 32 bits

      The duration, in milliseconds, of audio playout corresponding to
      Buffer Adjustment-type concealment, if known.

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


   Mean Playout Interrupt Size (ms): 16 bits

      The mean duration, in ms, of interruptions to normal playout which
      occurred during the reporting period.

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

## 3.  SDP Signaling

The use of the Session Description Protocol (SDP) [RFC4566] for
signaling the use of XR blocks is described in RFC 3611.  XR blocks
MAY be used without prior signaling.

This section augments the SDP attribute "rtcp-xr" [RFC3611] by
providing an 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

(defined in [RFC3611])

xr-format =/ xr-conceal-block

xr-conceal-block = "loss-conceal"

## 4.  IANA Considerations

New block types for RTCP XR are subject to IANA registration.  For
general guidelines on IANA considerations for RTCP XR, refer to RFC
3611.

### 4.1.  New RTCP XR Block Type value

This document assigns the block type value NJB in the IANA "RTCP XR
Block Type Registry" to the "Loss Concealment Metrics Block".

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

### 4.2.  New RTCP XR SDP Parameter

This document also registers a new parameter "loss-conceal" in the
"RTCP XR SDP Parameters Registry".

### 4.3.  Contact Information for Registrations

The contact information for the registrations is:

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## 5.  Security Considerations

   It is believed that this proposed RTCP XR report block introduces no
   new security considerations beyond those described in RFC 3611.  This
   block does not provide per-packet statistics so the risk to
   confidentiality documented in Section 7, paragraph 3 of RFC 3611 does
   not apply.

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   Raviraj, Albrecht Schwarz, Tom Taylor, and Hideaki Yamada.

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### 7.2.  Informative References

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October 2011.

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