RTCP XR Report Block for Loss Concealment Metric Reporting
draft-ietf-xrblock-rtcp-xr-loss-conceal-02.txt

Abstract

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

Status of This Memo

Copyright Notice

Table of Contents

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
   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 specified 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 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=<NLC>    | I |plc|  resv  |         block length=5        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                        SSRC of Source                         |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                    On-time Playout Duration                   |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |                   Loss Concealment Duration                   |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |            Buffer Adjustment Concealment Duration             |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |    Playout Interrupt Count    |   Mean Playout Interrupt Size  |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
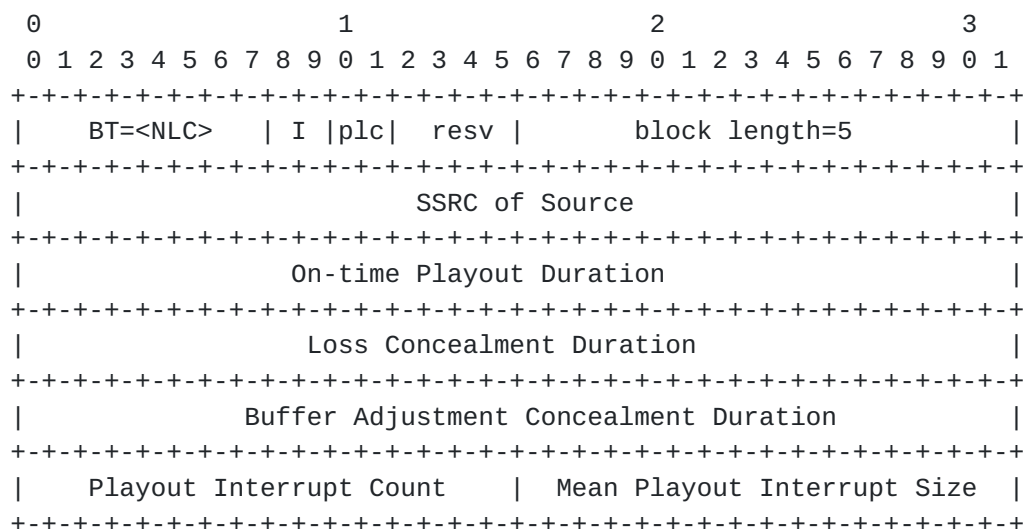
        Figure 1: Structure of the Loss Concealment Metrics Block

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 RTCP XR block
type allocated by IANA for this block.]

Interval Metric flag (I): 2 bits

   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 scheme:

      00 = silence insertion

      01 = simple replay, no attenuation

      10 = simple replay, with attenuation

      11 = enhanced

Reserved (resv): 4 bits

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

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 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 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 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
MUST be classified as loss concealment.

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 RFC 3611)

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 <NLC> 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:

Alan Clark (alan.d.clark@telchemy.com)

2905 Premiere Parkway, Suite 280
Duluth, GA 30097
USA

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.

6. Acknowledgements

The authors gratefully acknowledge the comments and suggestions made
by Bruce Adams, Philip Arden, Amit Arora, Bob Biskner, Kevin Connor,
Claus Dahm, Randy Ethier, Roni Even, Jim Frauenthal, Albert Higashi,
Tom Hock, Shane Holthaus, Paul Jones, Rajesh Kumar, Keith Lantz,
Mohamed Mostafa, Amy Pendleton, Colin Perkins, Mike Ramalho, Ravi
Raviraj, Albrecht Schwarz, Tom Taylor, and Hideaki Yamada.

7. References

7.1. Normative References

[RFC2119]   Bradner, S., "Key words for use in RFCs
                               to Indicate Requirement Levels", BCP 14,
                               RFC 2119, March 1997.

[RFC3550]   Schulzrinne, H., Casner, S., Frederick,
                               R., and V. Jacobson, "RTP: A Transport
                               Protocol for Real-Time Applications",
                               STD 64, RFC 3550, July 2003.

[RFC3611]   Friedman, T., Caceres, R., and A. Clark,
                               "RTP Control Protocol Extended Reports
                               (RTCP XR)", RFC 3611, November 2003.

[RFC4566]   Handley, M., Jacobson, V., and C.
                               Perkins, "SDP: Session Description
                               Protocol", RFC 4566, July 2006.

7.2. Informative References

[I-D.ietf-avtcore-monarch] Wu, W., Hunt, G., and P. Arden,
                               "Guidelines for Use of the RTP Monitoring
                               Framework", draft-ietf-avtcore-monarch-17
                               (work in progress), June 2012.

[RFC6390]   Clark, A. and B. Claise, "Guidelines for
                               Considering New Performance Metric
                               Development", BCP 170, RFC 6390,
                               October 2011.

Authors' Addresses

    Claire Bi
    Shanghai Research Institure of China Telecom Corporation Limited
    No.1835, South Pudong Road
    Shanghai   200122
    China

    EMail: bijy@sttri.com.cn

    Alan Clark
    Telchemy Incorporated
    2905 Premiere Parkway, Suite 280
    Duluth, GA   30097
    USA

    EMail: alan.d.clark@telchemy.com

    Geoff Hunt
    Unaffiliated

    EMail: r.geoff.hunt@gmail.com

    Qin Wu
    Huawei
    101 Software Avenue, Yuhua District
    Nanjing, Jiangsu   210012
    China

    EMail: sunseawq@huawei.com

    Glen Zorn (editor)
    Network Zen
    227/358 Thanon Sanphawut
    Bang Na, Bangkok   10260
    Thailand

    Phone: +66 (0) 90 920 1060
    EMail: glenzorn@gmail.com