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RTCP XR Blocks for Synchronization Delay and Offset Metrics Reporting
draft-asaeda-xrblock-rtcp-xr-synchronization-02

Abstract

This document defines an RTCP XR Report Block and associated SDP parameters that allow the reporting of synchronization delay and offset metrics for use in a range of RTP applications.

Status of this Memo

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1. Introduction

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

This new block type supports reporting of Initial synchronization delay. Information is recorded about the difference between the start of RTP sessions and the time the RTP receiver acquires all components of RTP sessions [RFC6051]. It also supports reporting of the general Synchronization offset status of an arbitrary number of streams, with the same RTCP CNAME. Information is recorded about the synchronization offset time of each RTP stream relative to the reference RTP stream with the same CNAME and General Synchronization Offset of zero.

The metrics belong to the class of transport level metrics defined in [MONARCH] (work in progress).

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].

3. Applicability

The report blocks defined in this document could be used by dedicated network monitoring applications.

When joining each session in layered video sessions [RFC6190] or the multimedia sessions, a receiver may not synchronize playout across the multimedia sessions or layered video sessions until RTCP SR packets have been received on all the components of RTP sessions. The components of RTP sessions are referred to as each RTP stream for each media type in multimedia sessions or each RTP stream at each layer in the layered video sessions. . For unicast session, the delay due to negotiation of NAT pinholes, firewall holes, quality-of-service, and media security keys is contributed to such initial synchronization playout. For multicast session, such initial synchronization delay varies with the session bandwidth and the number of members, the number of senders in the session. The RTP flow Initial synchronization delay block can be used to report the initial synchronization delay of these RTP streams beyond the information carried in the standard RTCP packet format. In the

absence of packet loss, the initial synchronization delay equals to the average time taken to receive the first RTCP packet in the RTP session with the longest RTCP reporting interval. In the presence of packet loss, the media synchronization needs to be based on the in-band mapping of RTP and NTP- format timestamps [RFC6051] or wait until the reporting interval has passed, and the next RTCP SR packet is sent.

In an RTP multimedia session, there can be an arbitrary number of streams, with the same RTCP CNAME. The RTP Flows General Synchronization Offset block can be used to report the general Synchronization offset status of these RTP streams beyond the information carried in the standard RTCP packet format. In the multimedia session, the first RTP packet can be chosen as the basic packet of reference RTP stream.

4. RTP Flows Initial Synchronization Delay Report Block

This block reports Initial synchronization delay beyond the information carried in the standard RTCP packet format. Information is recorded about the difference between the start of RTP sessions and the time the RTP receiver acquires all components of RTP sessions [RFC6051].

4.1. Metric Block Structure

The RTP Flows Initial Synchronization Delay 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										Reserved										Block length																			
SSRC of Source																																							
Initial Synchronization Delay																																							

4.2. Definition of Fields in RTP Flow Initial Synchronization Delay Metrics Block

Block type (BT): 8 bits

The Statistics Summary Report Block is identified by the constant <RFISD>.

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

The SSRC of the RTP data packet source being reported upon by this report block. (Section 4.1 of [RFC3611]).

Initial Synchronization Delay: 32 bits

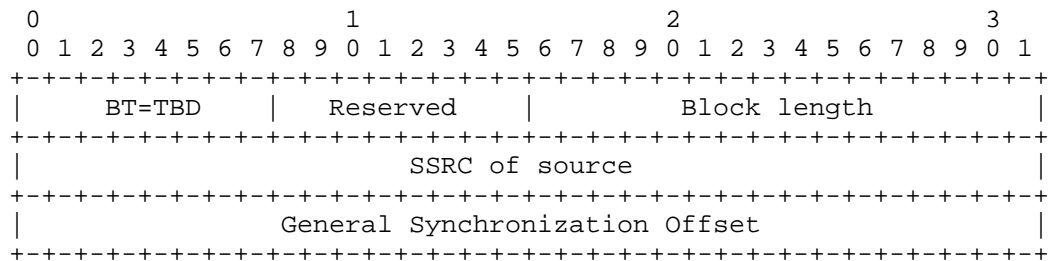
The average delay, expressed in units of 1/65536 seconds, between the RTCP packets received on all of the components RTP sessions and the beginning of session [RFC6051]. The value is calculated based on the information contained in RTCP SR packets or the in-band mapping of RTP and NTP- format timestamps [RFC6051]. If there is no packet loss, the initial synchronisation delay is expected to equal to the average time taken to receive the first RTCP packet in the RTP session with the longest RTCP reporting interval.

5. RTP Flows General Synchronization Offset Metrics Block

In the RTP multimedia sessions, there can be an arbitrary number of Streams and each type of media (e.g., audio or video) is sent in a separate RTP streams. The receiver associates RTP streams to be synchronised by means of RTCP CNAME contained in the RTCP Source Description (SDS) packets [RFC3550]. This block reports the general Synchronization offset status of these RTP streams beyond the information carried in the standard RTCP packet format. Information is recorded about the synchronization offset time of each RTP stream relative to the reference RTP stream with the same CNAME and General Synchronisation Offset of zero.

5.1. Metric Block Structure

The RTP Flow General Synchronization Offset Report Block has the following format:



5.2. Definition of Fields in RTP Flow General Synchronization Offset Metrics Block

Block type (BT): 8 bits

The RTP Flow General Synchronization Offset Report Block is identified by the constant <RFGSO>.

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

The SSRC of the RTP data packet source being reported upon by this report block. (Section 4.1 of [RFC3611]).

General synchronization offset: 32 bits

This field represents the synchronization offset time of one RTP stream in milliseconds relative to the reference RTP stream with the same CNAME and General Synchronisation Offset of zero [RFC6051] This value is calculated based on the interarrival time between arbitray RTP packet and the reference RTP packet with the same CNAME , and timestamps of this arbitray RTP packet and the reference RTP packet with the same CNAME.

6. SDP Signaling

Two new parameters are defined for the two report blocks defined in this document to be used with Session Description Protocol (SDP) [RFC4566] using the Augmented Backus-Naur Form (ABNF) [RFC5234]. They have the following syntax within the "rtcp-xr" attribute [RFC3611]:

```
rtcp-xr-attrib = "a=rtcp-xr:"  
                  [xr-format *(SP xr-format)] CRLF  
xr-format = RTP-flows-init-syn  
            / RTP-flows-general-syn  
  
RTP-flows-init-syn = "RTP-flows-init-syn"  
                    ["=" max-size]  
                    max-size = 1*DIGIT ; maximum block size in octets  
  
RTP-flow-general-syn = "RTP-flows-general-syn"  
                      ["=" max-size]  
                      max-size = 1*DIGIT ; maximum block size in octets
```

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

7. IANA Considerations

New report block types for RTCP XR are subject to IANA registration. For general guidelines on IANA allocations for RTCP XR, refer to Section 6.2 of [RFC3611].

This document assigns two new block type values in the RTCP XR Block Type Registry:

Name:	RFISD
Long Name:	RTP Flows Initial Synchronization Delay
Value	<RFISD>
Reference:	Section 4
Name:	RFGSO
Long Name:	RTP Flows General Synchronization Offset Metrics Block
Value	<RFGSO>
Reference:	Section 5

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

- * "RTP-flows-init-syn"
- * "RTP-flows-general-syn"

The contact information for the registrations is:

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8. Security Considerations

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

9. Acknowledgements

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10. References

10.1. Normative References

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- [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.
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- [RFC6051] Perkins, C. and T. Schierl, "Rapid Synchronisation of RTP Flows", RFC 6051, November 2010.
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10.2. Informative References

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ID draft-ietf-avtcore-monarch-00, April 2011.

Appendix A. Change Log

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

A.1. draft-asaeda-xrblock-rtcp-xr-synchronization-00

This document is separated from
draft-wu-xrblock-rtcp-xr-quality-monitoring-01 with some editorial
changes and focuses on RTP Flow Initial Synchronization Delay and RTP
Flows General Synchronization Offset.

A.2. draft-asaeda-xrblock-rtcp-xr-synchronization-01

Separate Synchronization Delay and Offset Metrics Block into two
independent block based on comments on the list.

A.3. draft-asaeda-xrblock-rtcp-xr-synchronization-02

The following are the major changes compared to previous version 01:

- o Clarify which synchronization is reported in section 4 and 5.
- o Allow calculating the synchronization delay based on RTP header
extension defined in RFC6051
- o Explain what the components of RTP session are in section 3.

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RTCP XR Report Block for TS Decodability Statistics Metric reporting
draft-huang-xrblock-rtcp-xr-decodability-01

Abstract

This document defines an RTCP XR Report Block that allows the reporting of decodability Statistics Metric used for Transport Stream.

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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1. Introduction

This draft defines a new block type to augment those defined in [RFC3611] for use in Transport Stream. The new block type supports the reporting of consistency of Transport Stream [ETSI] by checking TS header information. This new block type can be useful for identifying the existence, and characterizing the severity, of a packet transport problem which may affect users' perception of a service delivered over RTP, also useful for verifying the continued correct operation of an existing system management and providing accurate measures of Transport Stream quality for operators.

The new report block is in compliance with the monitoring architecture specified in [I-D.ietf-pmol-metrics-framework] (work in progress). The metric is applicable to any other types of RTP application that use TS standard format for transmission and storage of audio, video, and data.

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:

2.2. Acronyms

SSRC

Synchronization Source [RFC3550]

TS

Transport Stream [ISO-IEC.13818-1.2007]

3. TR 101 290 Decodability Statistics Metric Report Block

This block reports decodability statistics metric beyond the information carried in the standard RTCP packet format. Information is recorded about basic monitoring parameters necessary to ensure that the TS can be decoded including the number of Transport Stream Synchronization Losses, Sync byte errors, Continuity count errors, and continuous monitoring parameters including Transport errors, Program Clock Reference (PCR) errors, PCR repetition errors, PCR discontinuity indicator errors, and Presentation Time Stamp (PTS)

errors [ETSI]. Such information can be useful for network management and real time application quality monitoring.

Note that this metric report block is not only applicable to MPEG-2 transport streams[RFC2250],but also applicable to any other Transport Streams that adopt other audio and video codec.

The Decodability Metrics 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      |      rvd      |      block length      |
+-----+-----+-----+-----+-----+-----+-----+-----+
|                                     SSRC of source          |
+-----+-----+-----+-----+-----+-----+-----+-----+
|      begin_seq      |      end_seq      |
+-----+-----+-----+-----+-----+-----+-----+-----+
|                                     Number of TSs          |
+-----+-----+-----+-----+-----+-----+-----+-----+
|      Transport Stream Synchronization Losses              |
+-----+-----+-----+-----+-----+-----+-----+-----+
|                                     Sync byte errors        |
+-----+-----+-----+-----+-----+-----+-----+-----+
|      Continuity count errors                                |
+-----+-----+-----+-----+-----+-----+-----+-----+
|      Transport errors                                       |
+-----+-----+-----+-----+-----+-----+-----+-----+
|      PCR errors                                             |
+-----+-----+-----+-----+-----+-----+-----+-----+
|      PCR repetition errors                                  |
+-----+-----+-----+-----+-----+-----+-----+-----+
|      PCR discontinuity indicator errors                      |
+-----+-----+-----+-----+-----+-----+-----+-----+
|      PTS errors                                             |
+-----+-----+-----+-----+-----+-----+-----+-----+

```

block type (BT): 8 bits

A TR 101 290 decodability metrics report block is identified by the constant <TDM>.

rvd: 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.

block length: 16 bits

The constant 11, 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].

begin_seq: 16 bits

As defined in Section 4.1 of [RFC3611].

end_seq: 16 bits

As defined in Section 4.1 of [RFC3611].

Number of TSs: 32 bits

Number of Transport Streams in the above sequence number interval.

Transport Stream Synchronization Losses: 32 bits

Number of Transport Stream Synchronization Losses in the above sequence number interval.

Sync byte errors: 32 bits

Number of Transport sync byte errors in the above sequence number interval.

Continuity count error: 32 bits

Number of Transport Continuity count errors in the above sequence number interval.

Transport errors: 32 bits

Number of Transport errors in the above sequence number interval.

PCR errors: 32 bits

Number of PCR errors in the above sequence number interval.

PCR repetition errors: 32 bits

Number of Transport PCR repetition errors in the above sequence number interval.

PCR discontinuity indicator errors: 32 bits

Number of PCR discontinuity indicator errors in the above sequence number interval.

PTS errors: 32 bits

Number of PTS errors in the above sequence number interval.

4. SDP Signaling

One new parameter is defined for the one report blocks defined in this document to be used with Session Description Protocol (SDP) [RFC4566] using the Augmented Backus-Naur Form (ABNF) [RFC5234]. They have the following syntax within the "rtcp-xr" attribute [RFC3611]:

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

```
xr-format = decodability-metrics
```

```
decodability-metrics = "decodability-metrics"
```

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

5. IANA Considerations

New report block types for RTCP XR are subject to IANA registration. For general guidelines on IANA allocations for RTCP XR, refer to Section 6.2 of [RFC3611].

This document assigns one new block type values in the RTCP XR Block Type Registry:

Name:	TDM
Long Name:	TR 101 290 Decodability Metrics
Value	<TDM>
Reference:	section 3

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

* "decodability-metrics"

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6. Security Considerations

This proposed RTCP XR report block introduces no new security considerations beyond those described in [RFC3611].

7. References

7.1. Normative References

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RTCP XR Report Block for Burst/Gap Discard metric Reporting
draft-ietf-xrblock-rtcp-xr-burst-gap-discard-00.txt

Abstract

This document defines an RTCP XR Report Block that allows the reporting of Burst and Gap Discard 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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1. Introduction

1.1. Burst and Gap Discard Report Block

This draft defines a new block type to augment those defined in [RFC3611] for use in a range of RTP applications. The new block type supports the reporting of the proportion of packets discarded by the receiver due to jitter. The discards during discard bursts are reported, together with the number of bursts and additional data allowing the calculation of statistical parameters (mean and variance) of the distribution of burst lengths. This block is intended to be used in conjunction with [DISCARD] which provides the total packets discarded, and on which this block therefore depends. However the metric in [DISCARD] may be used independently of the metrics in this block.

This block provides information on transient IP problems. Burst/Gap metrics are typically used in Cumulative reports however MAY be used in Interval reports. The burstiness of packet discard affects user experience, may influence any sender strategies to mitigate the problem, and may also have diagnostic value.

The metric belongs to the class of transport-related terminal metrics defined in [MONARCH] (work in progress).

The definitions of Burst, Gap, Loss and Discard are consistent with definitions in [RFC3611]. To accommodate the range of jitter buffer algorithms and packet discard logic that may be used by implementors, the method used to distinguish between bursts and gaps may be an equivalent method to that defined in [RFC3611].

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 [PMOLFRAME] provides guidance on the definition and specification of performance metrics. Metrics described in this draft either reference external definitions or define metrics generally in accordance with the guidelines in [PMOLFRAME].

1.4. Applicability

These metrics are applicable to a range of RTP applications.

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:

Received, Lost and Discarded

A packet shall be regarded as lost if it fails to arrive within an implementation-specific time window. A packet that arrives within this time window but is too early or late to be played out shall be regarded as discarded. A packet shall be classified as one of received (or OK), discarded or lost.

Bursts and Gaps

The terms Burst and Gap are used in a manner consistent with that of RTCP XR [RFC3611]. RTCP XR views a RTP stream as being divided into bursts, which are periods during which the loss rate is high enough to cause noticeable quality degradation (generally over 5 percent loss rate), and gaps, which are periods during which lost packets are infrequent and hence quality is generally acceptable.

3. Burst/Gap Discard Block

Metrics in this block report on Burst/Gap Loss in the stream arriving at the RTP system.

3.1. Report Block Structure

Delay metrics block

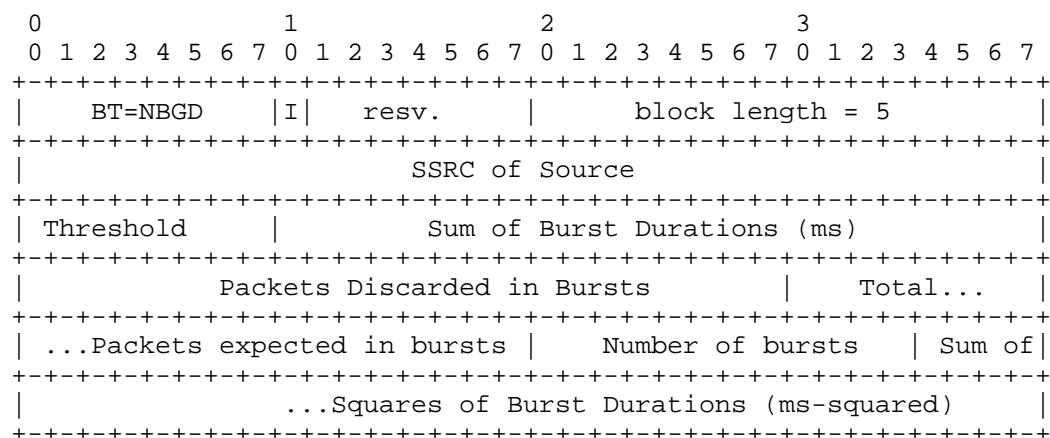


Figure 1: Report Block Structure

3.2. Definition of Fields in Burst/Gap Loss Report Block

Block type (BT): 8 bits

A Burst/Gap Loss Report Block is identified by the constant NBGL.

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

Interval Metric flag (I): 1 bit

This field is used to indicate whether the Packet Delay Variation metrics block is an Interval or a Cumulative report, that is, whether the reported values apply to the most recent measurement interval duration between successive metrics reports (I=1) (the Interval Duration) or to the accumulation period characteristic of cumulative measurements (I=0) (the Cumulative Duration).

Reserved (resv): 7 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 [RFC3611].

Threshold: 8 bits

The Threshold is equivalent to Gmin in [RFC3611], i.e. the number of successive packets that must be received prior to and following a lost frame in order for this lost frame to be regarded as part of a gap.

Sum of Burst Durations (ms): 24 bits

The total duration of bursts of lost frames in the period of the report (Interval or Cumulative).

If the measured value exceeds 0xFFFFFD, the value 0xFFFFFE SHOULD be reported to indicate an over-range measurement. If the measurement is unavailable, the value 0xFFFFF SHOULD be reported.

Packets lost in bursts: 24 bits

The total number of packets lost during loss bursts.

If the measured value exceeds 0xFFFFFD, the value 0xFFFFFE SHOULD be reported to indicate an over-range measurement. If the measurement is unavailable, the value 0xFFFFF SHOULD be reported.

Total packets expected in bursts: 24 bits

The total number of packets expected during loss bursts (that is, the sum of received packets and lost packets).

If the measured value exceeds 0xFFFFFD, the value 0xFFFFFE SHOULD be reported to indicate an over-range measurement. If the measurement is unavailable, the value 0xFFFFF SHOULD be reported.

Number of bursts: 16 bits

The number of bursts in the period of the report (Interval or Cumulative).

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

Sum of Squares of Burst Durations (ms-squared): 36 bits

The sum of the squares of burst durations (where individual burst durations are expressed in ms) over in the period of the report (Interval or Cumulative). The units for this quantity are milliseconds-squared.

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

3.3. Derived metrics based on reported metrics

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].

These metrics provides information relevant to statistical parameters, including:

- o The fraction of packets discarded during bursts
- o The fraction of packets discarded during gaps
- o burst duration mean
- o burst duration variance

The details on calculation these parameters in the metrics are

described in [SUMSTAT].

4. Considerations for Voice-over-IP applications

This metric block is applicable to a broad range of RTP applications. Where the metric is used with a Voice-overIP (VoIP) application, the following considerations apply.

RTCP XR views a call as being divided into bursts, which are periods during which the loss rate is high enough to cause noticeable call quality degradation (generally over 5 percent loss rate), and gaps, which are periods during which lost packets are infrequent and hence call quality is generally acceptable.

If Voice Activity Detection is used the Burst and Gap Duration shall be determined as if silence frames had been sent, i.e. a period of silence in excess of Gmin frames MUST terminate a burst condition.

The recommended value for the threshold Gmin in [RFC3611] results in a Burst being a period of time during which the call quality is degraded to a similar extent to a typical PCM Severely Errored Second [SDES].

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 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-bgd-block
```

```
xr-bgd-block = "brst-gap-dscrd"
```


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 value

This document assigns the block type value NDEL in the IANA "RTCP XR Block Type Registry" to the "Burst/Gap Discard Metrics Block".

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

6.2. New RTCP XR SDP Parameter

This document also registers a new parameter "brst-gap-dscrd" in the "RTCP XR SDP Parameters Registry".

6.3. Contact information for registrations

The contact information for the registrations is:

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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

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9. Changes from previous version

Changed BNF for SDP following Christian Groves' and Tom Taylor's comments (4th and 5th May 2009), now aligned with RFC 5234 section 3.3 "Incremental Alternatives".

Updated references.

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.

10.2. Informative References

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- [MONARCH] Hunt, G., "Monitoring Architectures for RTP", ID draft-ietf-avtcore-monarch-04, August 2011.
- [PMOLFRAME] Clark, A. and B. Claise, "Framework for Performance Metric Development", ID draft-ietf-pmol-metrics-framework-12, July 2011.
- [SDES] "", URL http://www.its.bldrdoc.gov/projects/devglossary/_severely_errored_second.html, October 2011.
- [SUMSTAT] Zorn, G., "RTCP XR for Summary Statistics Metrics Reporting", ID draft-zorn-xrblock-rtcp-xr-al-stat-03, October 2011.

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October 17, 2011

RTCP XR Report Block for Burst/Gap Loss metric Reporting
draft-ietf-xrblock-rtcp-xr-burst-gap-loss-00.txt

Abstract

This document defines an RTCP XR Report Block that allows the reporting of Burst and Gap Loss 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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Internet-Drafts are draft documents valid for a maximum of six months 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 19, 2012.

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1. Introduction

1.1. Burst and Gap Loss Report Block

This draft defines a new block type to augment those defined in [RFC3611] for use in a range of RTP applications. The new block type supports the reporting of the proportion of packets lost by the network. The losses during loss bursts are reported, together with the number of bursts and additional data allowing the calculation of statistical parameters (mean and variance) of the distribution of burst lengths. Some uses of these metrics depend on the availability of the metric "cumulative number of packets lost" from RTCP [RFC3550].

This block provides information on transient IP problems. Burst/Gap metrics are typically used in Cumulative reports however MAY be used in Interval reports. The burstiness of packet loss affects user experience, may influence any sender strategies to mitigate the problem, and may also have diagnostic value.

The metric belongs to the class of transport-related terminal metrics defined in [MONARCH] (work in progress).

The definitions of Burst, Gap, Loss and Discard are consistent with definitions in [RFC3611]. To accommodate the range of jitter buffer algorithms and packet discard logic that may be used by implementors, the method used to distinguish between bursts and gaps may be an equivalent method to that defined in [RFC3611]. The method used SHOULD produce the same result as that defined in [RFC3611] for conditions of burst packet loss, but MAY produce different results for conditions of time varying jitter.

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 [PMOLFRAME] provides guidance on the definition and specification of performance metrics. Metrics described in this draft either reference external definitions or define metrics generally in accordance with the guidelines in [PMOLFRAME].

1.4. Applicability

These metrics are applicable to a range of RTP applications.

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:

Received, Lost and Discarded

A packet shall be regarded as lost if it fails to arrive within an implementation-specific time window. A packet that arrives within this time window but is too early or late to be played out shall be regarded as discarded. A packet shall be classified as one of received (or OK), discarded or lost.

Bursts and Gaps

The terms Burst and Gap are used in a manner consistent with that of RTCP XR [RFC3611]. RTCP XR views a RTP stream as being divided into bursts, which are periods during which the loss rate is high enough to cause noticeable quality degradation (generally over 5 percent loss rate), and gaps, which are periods during which lost packets are infrequent and hence quality is generally acceptable.

3. Burst/Gap Loss Block

Metrics in this block report on Burst/Gap Loss in the stream arriving at the RTP system.

3.1. Report Block Structure

Delay metrics block

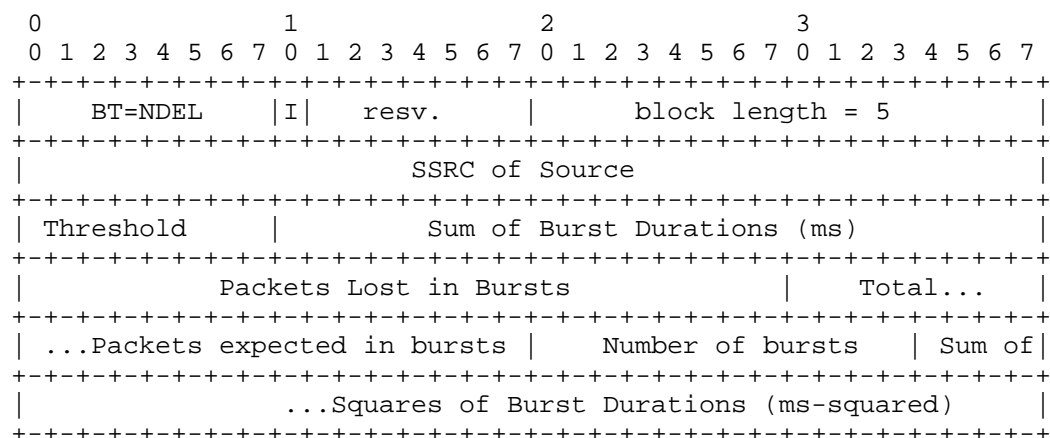


Figure 1: Report Block Structure

3.2. Definition of Fields in Burst/Gap Loss Report Block

Block type (BT): 8 bits

A Burst/Gap Loss Report Block is identified by the constant NBGL.

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

Interval Metric flag (I): 1 bit

This field is used to indicate whether the Packet Delay Variation metrics block is an Interval or a Cumulative report, that is, whether the reported values apply to the most recent measurement interval duration between successive metrics reports (I=1) (the Interval Duration) or to the accumulation period characteristic of cumulative measurements (I=0) (the Cumulative Duration).

Reserved (resv): 7 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 [RFC3611].

Threshold: 8 bits

The Threshold is equivalent to Gmin in [RFC3611], i.e. the number of successive packets that must be received prior to and following a lost frame in order for this lost frame to be regarded as part of a gap.

Sum of Burst Durations (ms): 24 bits

The total duration of bursts of lost frames in the period of the report (Interval or Cumulative).

If the measured value exceeds 0xFFFFFD, the value 0xFFFFFE SHOULD be reported to indicate an over-range measurement. If the measurement is unavailable, the value 0xFFFFF SHOULD be reported.

Packets lost in bursts: 24 bits

The total number of packets lost during loss bursts.

If the measured value exceeds 0xFFFFFD, the value 0xFFFFFE SHOULD be reported to indicate an over-range measurement. If the measurement is unavailable, the value 0xFFFFF SHOULD be reported.

Total packets expected in bursts: 24 bits

The total number of packets expected during loss bursts (that is, the sum of received packets and lost packets).

If the measured value exceeds 0xFFFFFD, the value 0xFFFFFE SHOULD be reported to indicate an over-range measurement. If the measurement is unavailable, the value 0xFFFFF SHOULD be reported.

Number of bursts: 16 bits

The number of bursts in the period of the report (Interval or Cumulative).

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

Sum of Squares of Burst Durations (ms-squared): 36 bits

The sum of the squares of burst durations (where individual burst durations are expressed in ms) over in the period of the report (Interval or Cumulative). The units for this quantity are milliseconds-squared.

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

3.3. Derived metrics based on reported metrics

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].

These metrics provides information relevant to statistical parameters, including:

- o The fraction of packets lost during bursts
- o The fraction of packets lost during gaps
- o burst duration mean
- o burst duration variance

The details on calculation these parameters in the metrics are

described in [SUMSTAT].

4. Considerations for Voice-over-IP applications

This metric block is applicable to a broad range of RTP applications. Where the metric is used with a Voice-overIP (VoIP) application, the following considerations apply.

RTCP XR views a call as being divided into bursts, which are periods during which the loss rate is high enough to cause noticeable call quality degradation (generally over 5 percent loss rate), and gaps, which are periods during which lost packets are infrequent and hence call quality is generally acceptable.

If Voice Activity Detection is used the Burst and Gap Duration shall be determined as if silence frames had been sent, i.e. a period of silence in excess of Gmin frames MUST terminate a burst condition.

The recommended value for the threshold Gmin in [RFC3611] results in a Burst being a period of time during which the call quality is degraded to a similar extent to a typical PCM Severely Errored Second [SDES].

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 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-bgl-block
```

```
xr-bgl-block = "brst-gap-loss"
```

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 value

This document assigns the block type value NDEL in the IANA "RTCP XR Block Type Registry" to the "Burst/Gap Loss Metrics Block".

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

6.2. New RTCP XR SDP Parameter

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

6.3. Contact information for registrations

The contact information for the registrations is:

Geoff Hunt (r.geoff.hunt@gmail.com)

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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

The authors gratefully acknowledge the comments and contributions 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.

9. Changes from previous version

Changed BNF for SDP following Christian Groves' and Tom Taylor's comments (4th and 5th May 2009), now aligned with RFC 5234 section 3.3 "Incremental Alternatives".

Updated references.

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.

10.2. Informative References

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- [PMOLFRAME] Clark, A. and B. Claise, "Framework for Performance Metric Development", ID draft-ietf-pmol-metrics-framework-12, July 2011.
- [SDES] "", URL http://www.its.bldrdoc.gov/projects/devglossary/_severely_errored_second.html, October 2011.
- [SUMSTAT] Zorn, G., "RTCP XR for Summary Statistics Metrics Reporting", ID draft-zorn-xrblock-rtcp-xr-al-stat-03, October 2011.

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RTCP XR Report Block for Delay metric Reporting
draft-ietf-xrblock-rtcp-xr-delay-00.txt

Abstract

This document defines an RTCP XR Report Block that allows the reporting of Delay 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.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months 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 19, 2012.

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1. Introduction

1.1. Packet Delay Metrics Block

This draft defines a new block type to augment those defined in [RFC3611] for use in a range of RTP applications. The new block type supports the reporting of the mean, minimum and maximum values of the network round-trip delay between RTP interfaces in peer RTP end systems as measured, for example, using the RTCP method described in [RFC3550]. It also supports reporting of the component of the round-trip delay internal to the local RTP system.

The network metrics belong to the class of packet transport delay metrics defined in [MONARCH] (work in progress).

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 [PMOLFRAME] provides guidance on the definition and specification of performance metrics. Metrics described in this draft either reference external definitions or define metrics generally in accordance with the guidelines in [PMOLFRAME].

1.4. Applicability

These metrics are applicable to a range of RTP applications.

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].

3. Delay Block

Metrics in this block report on packet delay in the stream arriving at the RTP system.

3.1. Report Block Structure

Delay metrics block

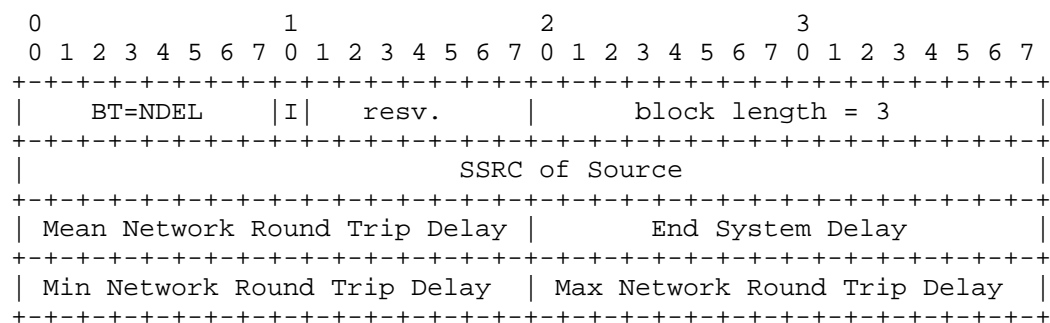


Figure 1: Report Block Structure

3.2. Definition of Fields in Delay Metrics Report Block

Block type (BT): 8 bits

A Delay Report Block is identified by the constant NDEL.

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

Interval Metric flag (I): 1 bit

This field is used to indicate whether the Packet Delay Variation metrics block is an Interval or a Cumulative report, that is, whether the reported values apply to the most recent measurement interval duration between successive metrics reports (I=1) (the Interval Duration) or to the accumulation period characteristic of cumulative measurements (I=0) (the Cumulative Duration).

Reserved (resv): 7 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 3.

SSRC of source: 32 bits

As defined in Section 4.1 of [RFC3611].

Mean Network Round Trip Delay (ms): 16 bits

The Mean Network Round Trip Delay is the mean value of the RTP-to-RTP interface round trip delay in ms over the measurement period, typically determined using RTCP SR/RR.

If only one measurement of Round Trip Delay is available for the timespan of the report (whether Interval or Cumulative), this single value should be reported as the mean value.

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

End System Delay (ms): 16 bits

The End System Delay is the internal round trip delay within the reporting endpoint, calculated using the nominal value of the jitter buffer delay plus the accumulation/ encoding and decoding / playout delay associated with the codec being used.

If the measured or estimated value exceeds 0xFFFFD, the value 0xFFFFE SHOULD be reported to indicate an over-range measurement. If the measurement is unavailable, the value 0xFFFF SHOULD be reported.

Min Network Round Trip Delay (ms): 16 bits

The Min Network Round Trip Delay is the minimum value of the RTP-to-RTP interface round trip delay in ms over the measurement period, typically determined using RTCP SR/RR.

If only one measurement of Round Trip Delay is available for the timespan of the report (whether Interval or Cumulative), this single value should be reported as the minimum value.

If the measured value exceeds 0xFFFFD, the value 0xFFFFE SHOULD be reported to indicate an over-range measurement. If the measurement is unavailable, the value 0xFFFFF SHOULD be reported.

Max Network Round Trip Delay (ms): 16 bits

The Max Network Round Trip Delay is the maximum value of the RTP-to-RTP interface round trip delay in ms over the measurement period, typically determined using RTCP SR/RR.

If only one measurement of Round Trip Delay is available for the timespan of the report (whether Interval or Cumulative), this single value should be reported as the maximum value.

If the measured value exceeds 0xFFFFD, the value 0xFFFFE SHOULD be reported to indicate an over-range measurement. If the measurement is unavailable, the value 0xFFFFF SHOULD be reported.

4. 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 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-delay-block
```

```
xr-delay-block ="delay"
```

5. 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].

5.1. New RTCP XR Block Type value

This document assigns the block type value NDEL in the IANA "RTCP XR Block Type Registry" to the "Delay Metrics Block".

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

5.2. New RTCP XR SDP Parameter

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

5.3. Contact information for registrations

The contact information for the registrations is:

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6. 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.

7. Contributors

The authors gratefully acknowledge the comments and contributions 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.

8. References

8.1. 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.

8.2. Informative References

- [MONARCH] Hunt, G., "Monitoring Architectures for RTP", ID draft-ietf-avtcore-monarch-04, August 2011.
- [PMOLFRAME] Clark, A. and B. Claise, "Framework for Performance Metric Development", ID draft-ietf-pmol-metrics-framework-12, July 2011.

Appendix A. Change Log

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

A.1. draft-ietf-xrblock-rtcp-xr-delay-00

The following are the major changes to previous version :

- o Changed BNF for SDP following Christian Groves' and Tom Taylor's comments (4th and 5th May 2009).
- o Updated references.

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RTCP XR Report Block for Discard metric Reporting
draft-ietf-xrblock-rtcp-xr-discard-00.txt

Abstract

This document defines an RTCP XR Report Block that allows the reporting of a simple discard count metric 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.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months 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 19, 2012.

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1. Introduction

1.1. Discard Report Block

This draft defines a new block type to augment those defined in [RFC3611] for use in a range of RTP applications. The new block type supports the reporting of the number of packets which are received correctly but are never played out, typically because they arrive too late to be played out (buffer underflow) or too early (buffer overflow). The metric is applicable both to systems which use packet loss repair techniques (such as forward error correction [RFC5109] or retransmission [RFC4588]) and to those which do not.

This metric is useful for identifying the existence, and characterising the severity, of a packet transport problem which may affect users' perception of a service delivered over RTP.

The metric belongs to the class of transport-related terminal metrics defined in [MONARCH] (work in progress).

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 [PMOLFRAME] provides guidance on the definition and specification of performance metrics. Metrics described in this draft either reference external definitions or define metrics generally in accordance with the guidelines in [PMOLFRAME].

1.4. Applicability

This metric is believed to be applicable to a large class of RTP applications which use a jitter buffer.

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:

Received, Lost and Discarded

A packet shall be regarded as lost if it fails to arrive within an implementation-specific time window. A packet that arrives within this time window but is too early or late to be played out shall be regarded as discarded. A packet shall be classified as one of received (or OK), discarded or lost. The Discard Metric counts only discarded packets. The metric "cumulative number of packets lost" defined in [RFC3550] reports a count of packets lost from the media stream (single SSRC within single RTP session). Similarly the metric "number of packets discarded" reports a count of packets discarded from the media stream (single SSRC within single RTP session) arriving at the receiver. Another metric defined in [POSTREPAIRLOSS] is available to report on packets which are not recovered by any repair techniques which may be in use.

3. Discard Metric Report Block

3.1. Report Block Structure

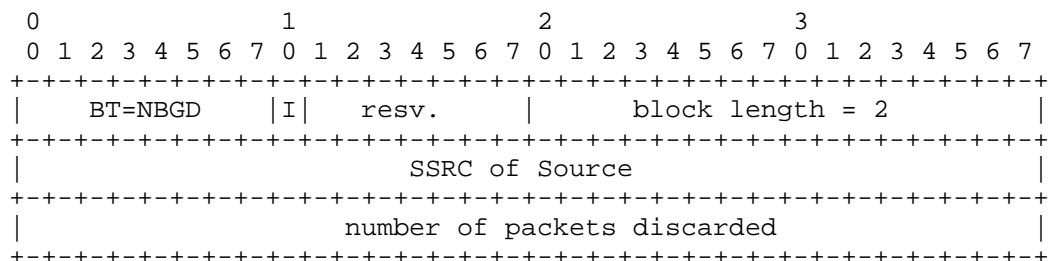


Figure 1: Report Block Structure

3.2. Definition of Fields in Discard Metric Report Block

Block type (BT): 8 bits

A Discard Metric Report Block is identified by the constant ND.

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

Interval Metric flag (I): 1 bit

This field is used to indicate whether the Packet Delay Variation metrics block is an Interval or a Cumulative report, that is, whether the reported values apply to the most recent measurement interval duration between successive metrics reports (I=1) (the Interval Duration) or to the accumulation period characteristic of cumulative measurements (I=0) (the Cumulative Duration).

Reserved (resv): 7 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 2.

SSRC of source: 32 bits

As defined in Section 4.1 of [RFC3611].

number of packets discarded: 32 bits

Number of packets discarded over the period (Interval or Cumulative) covered by this report.

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

Note that the number of packets expected in the period covered by the metric (whether interval or cumulative) is available from the difference between a pair of extended sequence numbers in the Measurement Identity block, so need not be repeated in this block.

4. 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 an additional value of "xr-format" to signal the use of the report block defined in this document.

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

(defined in [RFC3611])

```
xr-format =/ xr-pd-block
```

```
xr-pd-block = "pkt-dscrd"
```

5. 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].

5.1. New RTCP XR Block Type value

This document assigns the block type value ND in the IANA "RTCP XR Block Type Registry" to the "Discard Metrics Block".

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

5.2. New RTCP XR SDP Parameter

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

5.3. Contact information for registrations

The contact information for the registrations is:

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6. 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.

7. Contributors

The authors gratefully acknowledge the comments and contributions 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.

8. Changes from previous version

Changed BNF for SDP following Christian Groves' and Tom Taylor's comments (4th and 5th May 2009), now aligned with RFC 5234 section 3.3 "Incremental Alternatives".

Updated references.

9. References

9.1. 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.

9.2. Informative References

- [DISCARD] Hunt, G., "RTCP XR Report Block for Discard metric Reporting", ID draft-ietf-rtcp-xr-discard-02, May 2009.
- [MONARCH] Wu, Q., "Monitoring Architectures for RTP", ID draft-ietf-avtcore-monarch-04, August 2011.
- [PMOLFRAME] Clark, A. and B. Claise, "Framework for Performance Metric Development", ID draft-ietf-pmol-metrics-framework-12, July 2011.
- [POSTREPAIRLOSS] Hunt, G., "RTCP XR Report Block for Post-Repair Loss metric Reporting", ID draft-ietf-rtcp-xr-postrepair-loss-02, May 2009.
- [RFC4588] Rey, J., "RTP Retransmission Payload Format", RFC 4588, July 2006.
- [RFC5109] Li, A., "RTP Payload Format for Generic Forward Error Correction", RFC 5109, July 2006.

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Measurement Identity and information Reporting using SDES item and XR
Block
draft-ietf-xrblock-rtcp-xr-meas-identity-01.txt

Abstract

This document defines a RTCP SDES item and a RTCP XR Block carrying parameters which identify a measurement, to which one or more other RTCP XR Report Blocks may refer.

Status of this Memo

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

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months 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."

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the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

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1. Introduction

This draft defines one new RTCP SDES item and one new XR Report Block to carry parameters which identify a measurement for use in a range of RTP applications. The SDES item and the XR Report Block do not itself contain any measurement results (metrics). However, they provide information relevant to a measurement reported in one or more other block types, including

- o a field for incorporation of an application-specific auxiliary identifier,
- o the sequence number of the first packet of the RTP session,
- o the extended sequence numbers of the first packet of the current measurement interval, and the last packet included in the measurement,
- o the duration of the most recent measurement interval and
- o the duration of the interval applicable to cumulative measurements (which may be the duration of the RTP session to date).

The method for calculation of the extended RTP sequence number is provide in [RFC3550].

The RTCP SDES item containing the measurement identity is intended to provide information to relate RTP to a non-RTP session while the RTCP XR Report Block containing the measurement information is intended to provide a single copy of the information necessary to relate measurement data in the RTCP XR blocks to the stream, and measurement period, to which they refer. Commonly, multiple other small metric blocks contain measurement data for the same stream and period, and it would be a large overhead if all of these metric blocks carried duplicated data for measurement identification.

A RTCP Measurement Identity SDES packet MAY be associated with a set of RTCP XR metrics blocks which share the same application specific measurement identifier.

The RTCP XR Report Block MAY be associated with a set of RTCP XR metrics blocks which share the same information relevant to a reported measurement. There MAY be several such sets in an RTCP packet, in which each set share the same information relevant to a reported measurement. There MAY also be RTCP XR blocks in the packet which are not associated with a Measurement Information block, for example blocks which were defined before the Measurement Identity and information mechanism was introduced by this document.

1.1. 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].

1.2. Performance Metrics Framework

The Performance Metrics Framework [PMOLFRAME] provides guidance on the definition and specification of performance metrics. The RTP Monitoring Architectures [MONARCH] provides guideline for reporting block format using RTCP XR. Metrics or SDES item described in this draft either reference external definitions or define metrics generally in accordance with [PMOLFRAME][MONARCH].

1.3. Applicability

The RTCP SDES item and the RTCP XR block defined in this document provides information relevant to the measurement for members of a family of RTCP XR metrics blocks which are designed to use it. To use the mechanism defined here, the RTCP XR block containing measurement information is not required in the same RTCP packet as the SDES item contain measurement identity.

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]

3. Measurement Identity SDES Item

This section defines the format of Measurement Identity SDES item. The SDES item is carried in the RTCP SDES packet. The packet format for the RTCP SDES is defined in Section 6.5 of [RFC3550]. Each SDES packet has a fixed-length field for version, source count, packet type (PT), length as well as a variable-length field for the SDES item. In the SDES packet, the PT field is set to SDES (202).

3.1. APSI: Application Specific Identifier SDES Item

```

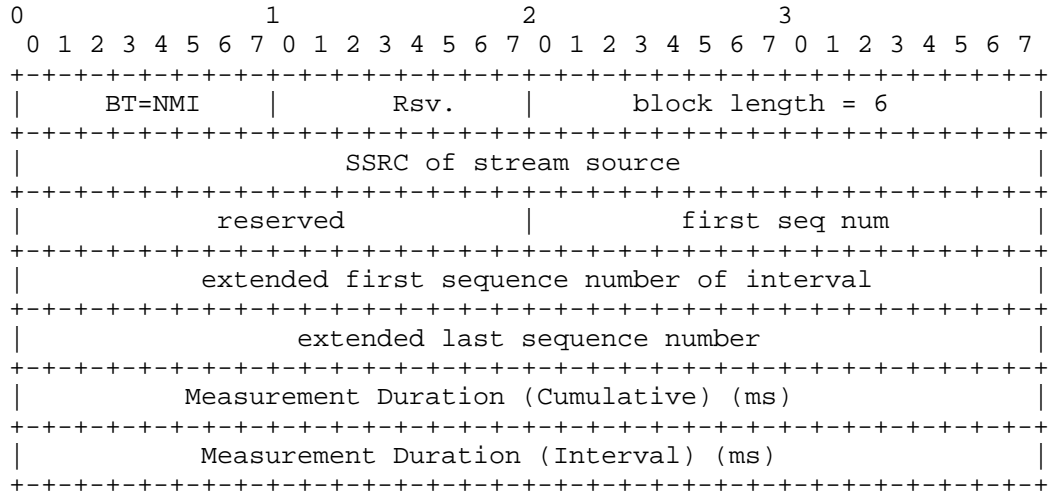
      0               1               2               3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   APSI=TBD   |   length   |application specific identifier
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|   ....
+---+---+---+---+---+

```

Application specific identifier is an additional identifier which is useful in the context of a specific application, e.g. an MPEG-2 transport identifier [MPEG2]. Where the identifier is less than 32 bits, the identifier SHOULD be mapped into the most significant bits of the field. If no additional identifier is provided, all bits of the field MUST be set to zero. This item MUST be ignored by applications which are not configured to make use of it.

4. Measurement Information XR Block

4.1. Report Block Structure



Report Block Structure

4.2. Definition of Fields in Measurement Information Report Block

Block type (BT): 8 bits

A Measurement Information Report Block is identified by the constant NMI.

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

Rsv.: 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.

Block Length: 16 bits

The length of this report block in 32-bit words minus one. For the Measurement Information block, the block length is equal to 7.

SSRC of source: 32 bits

As defined in Section 4.1 of [RFC3611].

Reserved: 16 bits

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

First seq num: 16 bits

The RTP sequence number of the first received RTP packet of the session, used to determine the number of packets contributing to cumulative measurements.

Extended first sequence number of interval: 32 bits

The extended RTP sequence number of the first received RTP packet of the current measurement interval.

Extended last sequence number: 32 bits

The extended RTP sequence number of the last received RTP packet which contributed to this measurement.

Measurement Duration (Cumulative) (ms): 32 bits

The duration in ms of the reporting interval applicable to Cumulative reports which use this Measurement Information block.

Measurement Duration (Interval) (ms): 32 bits

The duration in ms of the reporting interval applicable to Interval reports which use this Measurement Information block.

5. IANA Considerations

New SDES types for RTCP SDES are subject to IANA registration. For general guidelines on IANA considerations for RTCP SDES, refer to [RFC3550].

5.1. New RTCP SDES Type value

This document assigns additional five SDES types in the IANA "RTCP XR Block Type Registry" to the Measurement Identity SDES items as follow:

abbrev.	name	value
APSI:	Application Specific Identifier	TBD

[Note to RFC Editor: please replace APSI with the IANA provided RTCP SDES type for the SDES item.]

5.2. New RTCP XR Block Type value

This document assigns the block type value NMI in the IANA "RTCP XR Block Type Registry" to the "Measurement Information Block".

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

5.3. Contact information for registrations

The contact information for the registrations is:

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China

6. Security Considerations

RTCP reports can contain sensitive information since they can provide information about the nature and duration of a session established between two or more endpoints. Therefore, the use of security mechanisms with RTP documented in Section 9 of [RFC3550] should apply.

7. References

7.1. 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.

7.2. Informative References

- [MONARCH] Wu, Q., "Monitoring Architectures for RTP", ID draft-ietf-avtcore-monarch-04, August 2011.
- [MPEG2] "ISO/IEC, "Standard 13818-1"", December 2000.
- [PMOLFRAME] Clark, A. and B. Claise, "Framework for Performance Metric Development", ID draft-ietf-pmol-metrics-framework-12, July 2011.

Appendix A. Change Log

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

A.1. draft-ietf-xrblock-xr-rtcp-meas-identity-00

The following are the major changes to draft-ietf-avt-rtcp-xr-meas-identity-02:

- o Change the use of SDES item to convey measurement identity instead of XR Block in section 2.
- o Update references.
- o Update security section and remove SDP signaling section.

A.2. draft-ietf-xrblock-xr-rtcp-meas-identity-01

The following are the major changes to draft-ietf-xrblock-xr-rtcp-meas-identity-00:

- o Replace SDES item containing additional measurement information with XR Block.
- o Add section 2 to describe following RFC2119 language.
- o Add Section 1.2 to make SDES item and XR Report be compliant with RFC3550 and RFC3611
- o Add Section 1.3 to make SDES item and XR Report follow Performance Metrics Framework and RTP Monitoring Architecture.
- o Add section5.2 to register the new RTCP XR Block Type value.
- o Remove RTCP SDES Type values that are needed.

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RTCP XR Report Block for Packet Delay Variation Metric Reporting
draft-ietf-xrblock-rtcp-xr-pdv-01.txt

Abstract

This document defines an RTCP XR Report Block that allows the reporting of Packet Delay Variation metrics for 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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1. Introduction

1.1. Packet Delay Variation Metrics Block

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

The new block type provides information on Packet Delay Variation using one of several standard metrics.

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

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 in accordance with [RFC3550] and [RFC3611].

1.3. Performance Metrics Framework

The Performance Metrics Framework [PMOLFRAME] provides guidance on the definition and specification of performance metrics. Metrics described in this draft either reference external definitions or define metrics generally in accordance with the guidelines in [PMOLFRAME].

1.4. Applicability

These metrics are applicable to a range of RTP applications.

2. Definitions

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

$0.0 \text{ to } 1 - 1/65536 = 0.9999847$

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 0xffffe and 0xffff are used as flags for "over-range" and "unavailable" conditions, a 0:16 quantity has range

$0.0 \text{ to } 1 - 3/65536 = 0.9999542$

3. Packet Delay Variation Metrics Block

Metrics in this block report on packet delay variation in the stream arriving at the RTP system.

3.1. Report Block Structure

PDV metrics block

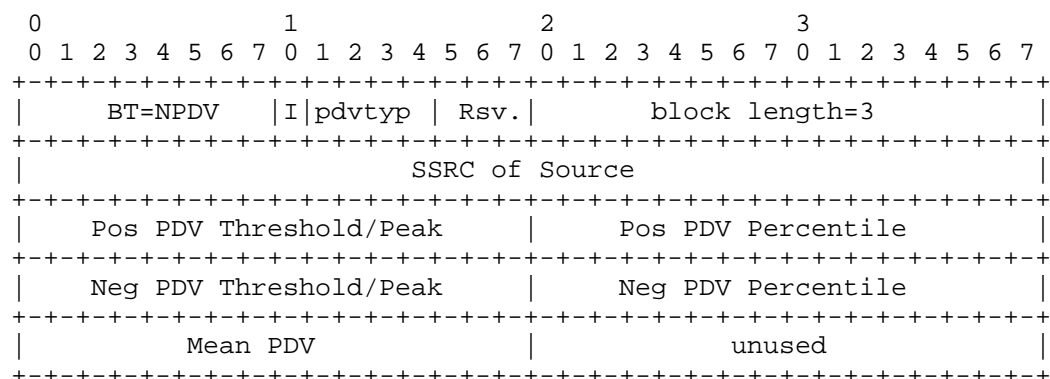


Figure 1: Report Block Structure

3.2. Definition of Fields in PDV Metrics Block

Block type (BT): 8 bits

A Packet Delay Variation Metrics Report Block is identified by the constant NPDV.

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

Interval Metric flag (I): 1 bit

This field is used to indicate whether the Packet Delay Variation metrics block is an Interval or a Cumulative report, that is, whether the reported values apply to the most recent measurement interval duration between successive metrics reports (I=1) (the Interval Duration) or to the accumulation period characteristic of cumulative measurements (I=0) (the Cumulative Duration).

Packet Delay Variation Metric Type (pdvtyp): 4 bits

This field is used to identify the Packet Delay Variation Metric Type used in this report block, according to the following code:

bits 014-017

0: interarrival jitter, Section 6.4.1 of [RFC3550],

1: MAPDV2, Clause 6.2.3.2 of [G.1020],

2: 2-point PDV, Clause 6.2.4 of [Y.1540].

Rsv.: 3 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 length of this report block in 32-bit words, minus one. For the Packet Delay Variation Metrics block, the block length is equal to 3.

SSRC of source: 32 bits

As defined in Section 4.1 of [RFC3611].

Positive PDV Threshold/Peak: 16 bits

This field is associated with the Positive PDV percentile and expressed in Milliseconds with numeric format S11:4. The term Positive represents that the packets are arriving later than the expected time.

If the measured value is more negative than -2047.9375 (the value which would be coded as 0x8001), the value 0x8000 SHOULD be reported to indicate an over-range negative measurement. If the measured value is more positive than +2047.8125 (the value which would be coded as 0x7FFD), the value 0x7FFE SHOULD be reported to indicate an over-range positive measurement. If the measurement is unavailable, the value 0x7FFF SHOULD be reported.

Positive PDV Percentile: 16 bits

The percentages of packets in the RTP stream for which individual packet delays were less than the Positive PDV Threshold. It is expressed in numeric format 8:8 with values from 0 to 100th percentile.

If the measurement is unavailable, the value 0xFFFF SHOULD be reported.

Negative PDV Threshold/Peak: 16 bits

This field is associated with the Negative PDV percentile and expressed in Milliseconds with numeric format S11:4. The term Negative represents that the packets are arriving earlier than the expected time.

If the measured value is more negative than -2047.9375 (the value which would be coded as 0x8001), the value 0x8000 SHOULD be reported to indicate an over-range negative measurement. If the measured value is more positive than +2047.8125 (the value which would be coded as 0x7FFD), the value 0x7FFE SHOULD be reported to indicate an over-range positive measurement. If the measurement is unavailable, the value 0x7FFF SHOULD be reported.

Negative PDV Percentile: 16 bits

The percentages of packets in the RTP stream for which individual packet delays were more than the Negative PDV Threshold. It is expressed in numeric format 8:8 with values from 0 to 100th percentile.

If the measurement is unavailable, the value 0xFFFF SHOULD be reported.

If the PDV Type indicated is 2-point PDV and the Positive and Negative PDV Percentiles are set to 100.0 then the Positive and Negative Threshold/Peak PDV values are the peak values measured during the reporting interval (which may be from the start of the call for cumulative reports). In this case, the difference between the Positive and Negative Threshold/Peak values defines the range of 2-point PDV.

Mean PDV: 16 bits

The mean PDV value of data packets is expressed in milliseconds with Numeric format S11:4 format.

For MAPDV2 this value is generated according to Clause 6.2.3.2 of [G.1020]. For interval reports the MAPDV2 value is reset at the start of the interval.

For interarrival jitter, the value reported is the value of $J(i)$ calculated according to [RFC3550] at the time the report is generated.

For 2-point PDV, the value reported is the mean of per-packet 2-point PDV values. This metric indicates the arrival time of the first media packet of the session with respect to the mean of the arrival times of every packet of the session. A single value of the metric (for a single session) may not be useful by itself, but its average over a number of sessions may be useful in diagnosing media delay at session startup. For example, this might occur if media packets are often delayed behind signalling packets due to head-of-line blocking.

If the measured value is more negative than -2047.9375 (the value which would be coded as 0x8001), the value 0x8000 SHOULD be reported to indicate an over-range negative measurement. If the measured value is more positive than +2047.8125 (the value which would be coded as 0x7FFD), the value 0x7FFE SHOULD be reported to indicate an over-range positive measurement. If the measurement is unavailable, the value 0x7FFF SHOULD be reported.

Unused: 16 bits

These bits are unused. They SHOULD be set to zero by the sender and MUST be ignored by the receiver.

3.3. Guidance on use of PDV metrics

This subsection provides informative guidance on when it might be appropriate to use each of the PDV metric types.

Interarrival jitter (Section 6.4.1 of [RFC3550]) allows comparison of results with those from RTP end systems which support only RTCP as defined in [RFC3550].

MAPDV2 (Clause 6.2.3.2 of [G.1020]) compares instantaneous (per-

packet) delay variation against a moving average delay variation. This metric could be useful in determining residual impairment when an RTP end system uses an adaptive de-jitter buffer which tracks the average delay variation, provided the adaptive de-jitter buffer have similar averaging behaviour as the MAPDV2 algorithm.

2-point PDV (Clause 6.2.4 of [Y.1540]) reports absolute packet delay variation with respect to the time of arrival of the first packet of the connection. In an RTP context, the two "points" are at the sender (the synchronization source which applies RTP timestamps) and at the receiver. The value of this metric for the packet with index j is identical to the quantity $D(i,j)$ defined in Section 6.4.1 of [RFC3550] if the packet index i is set equal to 1, that is, the reference packet for the metric is the first packet of the connection. The metric includes the effect of the frequency offsets of clocks in both the sender and receiver end systems, so it is useful mainly in network where synchronisation is distributed. As well as measuring packet delay variation in such networks, it may be used to ensure that synchronisation is effective, for example where the network carries ISDN data traffic over RTP [RFC4040]. The metric is likely to be useful in networks which use fixed de-jitter buffering, because it may be used to determine the length of the required de-jitter buffer, or to determine if network performance has deteriorated such that existing de-jitter buffers are too small to accommodate the observed delay variation.

3.4. Examples of use

(a) To report interarrival jitter [RFC3550]:

```
PDV Threshold = FFFF (Undefined); PDV Percentile = FFFF  
(Undefined); PDV type = 0 (interarrival jitter)
```

causes interarrival jitter to be reported in the Mean PDV field.

(b) To report MAPDV2 [G.1020]:

```
Pos PDV Threshold = 50.0; Pos PDV Percentile = 95.3; Neg PDV  
Threshold = 50.0 (note this implies -50ms); Neg PDV Percentile  
= 98.4; PDV type = 1 (MAPDV2)
```

causes average MAPDV2 to be reported in the Mean PDV field.

Note that implementations may either fix the reported percentile and calculate the associated PDV level or may fix a threshold PDV level and calculate the associated percentile. From a practical implementation perspective it is simpler to

use the second of these approaches (except of course in the extreme case of a 100% percentile).

2-point PDV, according to [Y.1540] is the difference in delay between the current packet and the first packet of the stream. If the sending and receiving clocks are not synchronized, this metric includes the effect of relative timing drift.

4. 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 an additional value of "xr-format" to signal the use of the report block defined in this document.

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

(defined in [RFC3611])

```
xr-format =/ xr-pdv-block
```

```
xr-pdv-block = "pkt-dly-var" [ "," pdvtype ] [ "," nspec "," pspec ]
```

```
pdvtype      = "pdv="      0      ; interarrival jitter RFC 3550
                / 1      ; MAPDV2 ITU-T G.1020
                / 2      ; 2-point PDV ITU-T Y.1540
nspec        = "nthr=" fixpoint ; negative PDV threshold (ms)
                / "npc=" fixpoint ; negative PDV percentile
pspec        = "pthr=" fixpoint ; positive PDV threshold (ms)
                / "ppc=" fixpoint ; positive PDV percentile

fixpoint      = 1*DIGIT "." 1*DIGIT ; fixed point decimal
DIGIT         = %x30-39
```

When SDP is used in offer-answer, a system sending SDP may request a specific type of PDV measurement. In addition, they may state a specific percentile or threshold value, and expect to receive the corresponding threshold or percentile metric, respectively. The system receiving the SDP SHOULD send the PDV metrics requested, but if the metric is not available, the system receiving the SDP SHOULD send the metric block with the flag value indicating that the metric is unavailable.

5. 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].

5.1. New RTCP XR Block Type value

This document assigns the block type value NPDV in the IANA "RTCP XR Block Type Registry" to the "Packet Delay Variation Metrics Block".

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

5.2. New RTCP XR SDP Parameter

This document also registers a new parameter "pkt-dly-var" in the "RTCP XR SDP Parameters Registry".

5.3. Contact information for registrations

The contact information for the registrations is:

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Nanjing, Jiangsu 210012
China

5.4. New registry of PDV types

This document creates a new registry to be called "RTCP XR PDV block - PDV type" as a sub-registry of the "RTP Control Protocol Extended Reports (RTCP XR) Block Type Registry". Policies for this new registry are as follows:

- o The information required to support an assignment is an unambiguous definition of the new metric, covering the base measurements and how they are processed to generate the reported metric. This should include the units of measurement, how values of the metric are reported in the three 16-bit fields "Pos PDV Threshold/Peak", "Neg PDV Threshold/Peak" and "Mean PDV" within the report block, and how the metric uses the two 16-bit fields "Pos PDV Percentile" and "Neg PDV Percentile".

- o The review process for the registry is "Specification Required" as described in Section 4.1 of [RFC5226].
- o Entries in the registry are integers. The valid range is 0 to 15 corresponding to the 4-bit field "pdvtyp" in the block. Values are to be recorded in decimal.
- o Initial assignments are as follows:
 1. interarrival jitter, Section 6.4.1 of [RFC3550],
 2. MAPDV2, Clause 6.2.3.2 of [G.1020],
 3. 2-point PDV, Clause 6.2.4 of [Y.1540]

6. 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.

7. References

7.1. Normative References

- [G.1020] ITU-T, "ITU-T Rec. G.1020, Performance parameter definitions for quality of speech and other voiceband applications utilizing IP networks", July 2006.
 - [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.
 - [RFC4040] Kreuter, R., "RTP Payload Format for a 64 kbit/s Transparent Call", April 2005.
 - [RFC4566] Handley, M., Jacobson, V., and C. Perkins, "SDP: Session Description Protocol", July 2006.
 - [RFC5226] Narten, T., "Guidelines for Writing an IANA Considerations Section in RFCs", May 2008.
- BCP 26
- [Y.1540] ITU-T, "ITU-T Rec. Y.1540, IP packet transfer and availability performance parameters", November 2007.

7.2. Informative References

- [MONARCH] Hunt, G., "Monitoring Architectures for RTP", ID draft-ietf-avtcore-monarch-04, August 2011.
- [PMOLFRAME] Clark, A. and B. Claise, "Framework for Performance Metric Development", ID draft-ietf-pmol-metrics-framework-12, July 2011.

Appendix A. Change Log

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

A.1. draft-ietf-avt-rtcp-xr-pdv-03

The following are the major changes to previous version :

- o Changed BNF for SDP following Christian Groves' and Tom Taylor's comments (4th and 5th May 2009).
- o Updated references.

A.2. draft-ietf-xrblock-rtcp-xr-pdv-00

The following are the major changes to previous version draft-ietf-avt-rtcp-xr-pdv-03 :

- o Updated references.

A.3. draft-ietf-xrblock-rtcp-xr-pdv-01

The following are the major changes to previous version draft-ietf-xrblock-rtcp-xr-pdv-00 :

- o Fix typos or nits in the definition of Negative PDV Threshold/Peak.
- o Fix nits in Numeric format S7:8.
- o remove the text that is relevant to tag field.
- o Add text in SDP signaling section to clarify indication of metric unavailable.

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XR Block Working Group
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Real-time Transport Control Protocol Extension Report for Run Length
Encoding of Discarded Packets
draft-ott-xrblock-rtcp-xt-discard-metrics-01.txt

Abstract

The Real-time Transport Control Protocol (RTCP) is used in conjunction with the Real-time Transport Protocol (RTP) in to provide a variety of short-term and long-term reception statistics. The available reporting may include aggregate information across longer periods of time as well as individual packet reporting. This document specifies a per-packet report metric capturing individual packets discarded from the jitter buffer after successful reception.

Status of this Memo

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1. Introduction

RTP [RFC3550] provides a transport for real-time media flows such as audio and video together with the RTP control protocol which provides periodic feedback about the media streams received in a specific duration. In addition, RTCP can be used for timely feedback about individual events to report (e.g., packet loss) [RFC4585]. Both long-term and short-term feedback enable a sender to adapt its media transmission and/or encoding dynamically to the observed path characteristics.

RFC3611 [RFC3611] defines RTCP eXtension Reports as a detailed reporting framework to provide more than just the coarse RR statistics. The detailed reporting may enable a sender to react more appropriately to the observed networking conditions as these can be characterized better, albeit at the expense of extra overhead.

Among many other fields, RFC3611 specifies the Loss RLE block which define runs of packets received and lost with the granularity of individual packets. This can help both error recovery and path loss characterization. In addition to lost packets, RFC 3611 defines the notion of "discarded" packets: packets that were received but dropped from the jitter buffer because they were either too early (for buffering) or too late (for playout). This metric is part of the VoIP metrics report block even though it is not just applicable to audio: it is specified as the fraction of discarded packets since the beginning of the session. See section 4.7.1 of RFC3611 [RFC3611].

Recently proposed extensions to the XR reporting suggest enhancing this discard metric:

- o Reporting the number of discarded packets during either the last reporting interval or since the beginning of the session, as indicated by a flag in the suggested XR report [I-D.ietf-avt-rtcp-xr-discard].
- o Reporting gaps and bursts of discarded packets during the last reporting interval or cumulatively since the beginning of the session [I-D.ietf-avt-rtcp-xr-burst-gap-discard].

However, none of these metrics allow a receiver to report precisely which packets were discarded. While this information could in theory be derived from high-frequency reporting on the number of discarded packets or from the gap/burst report, these two mechanisms do not appear feasible: The former would require an unduly high amount of reporting which still might not be sufficient due to the non-deterministic scheduling of RTCP packets. The latter incur significant complexity and reporting overhead and might still not deliver the desired accuracy.

This document defines a discard report block following the idea of the run-length encoding applied for lost and received packets in RFC3611.

Complementary to or instead of the indication which packets were lost, an XR block is defined to indicate the number of bytes lost, per interval or for the duration of the session, similar to other XR report blocks.

2. Terminology

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 BCP 14, RFC 2119 [RFC2119] and indicate requirement levels for compliant implementations.

The terminology defined in RTP [RFC3550] and in the extensions for XR reporting [RFC3611] applies.

3. XR Discard RLE Report Block

The XR Discard RLE report block uses the same format as specified for the loss and duplicate report blocks in RFC3611 [RFC3611]. Figure 1 recaps the packet format. The fields "BT", "T", "block length", "SSRC of source", "begin_seq", and "end_seq" SHALL have the same semantics and representation as defined in RFC3611. The "chunks" encoding the run length SHALL have the same representation as in RFC3611, but encode discarded packets.

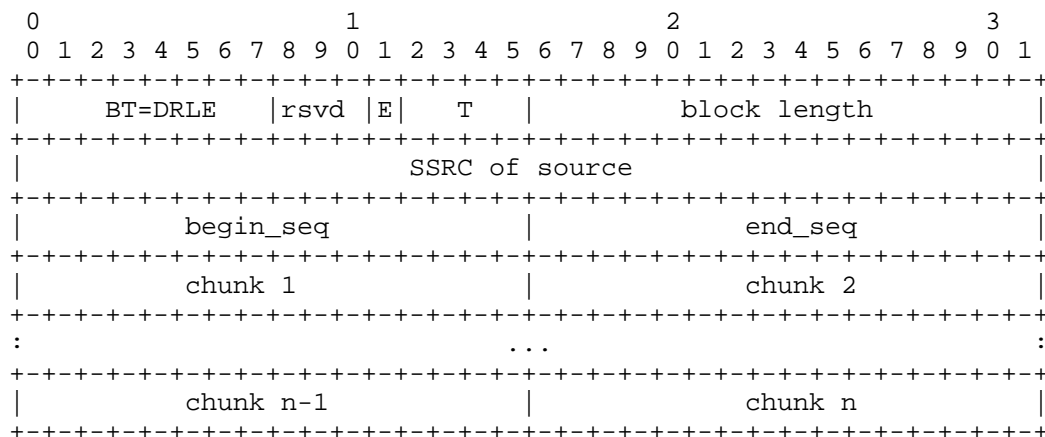


Figure 1: XR Discard Report Block

The 'E' bit is introduced to distinguish between packets discarded due to early arrival and those discarded due to late arrival. The 'E' bit MUST be set to '1' if the chunks represent packets discarded due to too early arrival and MUST be set to '0' otherwise.

In case both early and late discarded packets shall be reported, two Discard RLE report blocks MUST be included; their sequence number range MAY overlap, but individual packets MUST only be reported as either early or late. Packets reported in both MUST be considered as discarded without further information available, packets reported in neither are considered to be properly received and not discarded.

Discard RLE Report Blocks SHOULD be sent in conjunction with an RTCP RR as a compound RTCP packet.

Editor's node: is it acceptable to use one of the 'reserved' bits for this purpose or should two block types be used?

4. XR Bytes Discarded Report Block

The XR Bytes Discarded report block uses the following format which follows the model of the framework for performance metric development [I-D.ietf-pmol-metrics-framework].

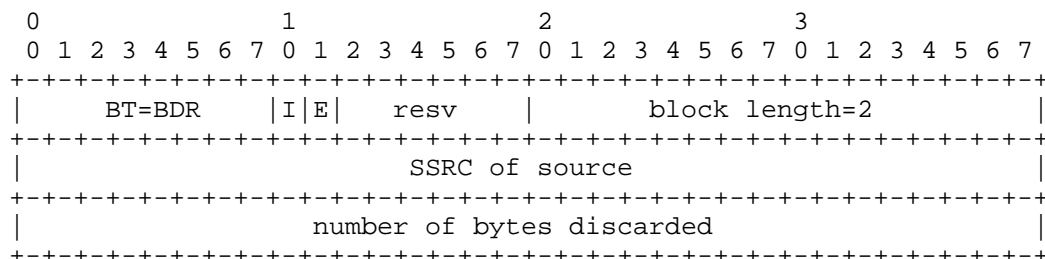


Figure 2: XR Bytes Discarded Report Block

The Interval Metric flag (I) (1 bit) is used to indicate whether the Post-Repair Loss metric is an Interval or a Cumulative metric, that is, whether the reported value applies to the most recent measurement interval duration between successive metrics reports (I=1) (the Interval Duration) or to the accumulation period characteristic of cumulative measurements (I=0) (the Cumulative Duration). Numerical values for both these intervals are provided in the Measurement Identifier block referenced by the tag field below.

The 'E' bit is introduced to distinguish between packets discarded due to early arrival and those discarded due to late arrival. The 'E' bit MUST be set to '1' if the chunks represent packets discarded due to too early arrival and MUST be set to '0' otherwise. In case both early and late discarded packets shall be reported, two Bytes Discarded report blocks MUST be included.

The 'number of bytes discarded' is a 32-bit unsigned integer value indicating the total number of bytes discarded (I=0) or the number of bytes discarded since the last RTCP XR Bytes Discarded block was sent.

Bytes Discarded Report Blocks SHOULD be sent in conjunction with an RTCP RR as a compound RTCP packet.

Editor's note: is it acceptable to use one of the 'reserved' bits for this purpose or should two block types be used?

5. Protocol Operation

This section describes the behavior of the reporting (= receiver) RTP node and the sender RTP node.

5.1. Reporting Node (Receiver)

Transmission of RTCP XR Discard RLE Reports is up to the discretion of the receiver, as is the reporting granularity. However, it is RECOMMENDED that the receiver signals all discarded packets using the method defined in this document. If all packets over a reporting period were lost, the receiver MAY use the Discard Report Block [I-D.ietf-avt-rtcp-xr-discard] instead. In case of limited available reporting bandwidth, it is up to the receiver whether or not to include RTCP XR Discard RLE reports or not.

The receiver MAY send the Discard RLE Reports as part of the regularly scheduled RTCP packets as per RFC3550. It MAY also include Discard RLE Reports in immediate or early feedback packets as per RFC4585.

5.2. Media Sender

The media sender MUST be prepared to operate without receiving any Discard RLE reports. If Discard RLE reports are generated by the receiver, the sender cannot rely on all these reports being received, nor can the sender rely on a regular generation pattern from the receiver side.

However, if the sender receives any RTCP reports but no Discard RLE report blocks and is aware that the receiver supports Discard RLE report blocks, it MAY assume that no packets were discarded at the receiver.

6. SDP signaling

The report blocks specified in this document define extensions to RTCP XR reporting. Whether or not this specific extended report is sent is left to the discretion of the receiver. Its presence may enable better operation of the sender since more detailed information is available. Not providing this information will make the sender rely on other RTCP report metrics.

A participant of a media session MAY use SDP to signal its support for this attribute. In this case, the RTCP XR attribute as defined in RFC3611 [RFC3611] MUST be used. The SDP RFC4566 [RFC4566] attribute 'xr-format' defined in RFC3611 is augmented as described in the following to indicate the discard metric.

```
rtcp-xr-attrib = "a=" "rtcp-xr" ":" [xr-format *(SP xr-format)]  
                CRLF    ; defined in [RFC3611]  
  
xr-format      =/ xr-discard-rle  
                / xr-discard-bytes  
  
xr-discard-rle  = "discard-rle"  
xr-discard-bytes = "discard-bytes"
```

The literal 'discard-rle' MUST be used to indicate support for the Discard RLE Report Block defined in section Section 3, the literal 'discard-bytes' to indicate support for the Bytes Discarded Report Block defined in section Section 4

For signaling support for the discard metric, the rules defined in RFC3611 apply. Generally, senders and receivers SHOULD indicate this capability if they support this metric and would like to use it in the specific media session being signaled. The receiver MAY decide not to send discard information unless it knows about the sender's support to save on RTCP reporting bandwidth.

A participant in a media session MAY use the two report blocks specified in this document without any explicit (SDP) signaling.

7. Security Considerations

The security considerations of RFC3550, RFC3611, and RFC4585 apply. Since this document offers only a more precise reporting for an already existing metric, no further security implications are foreseen.

8. 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 [RFC3611].

8.1. XR Report Block Registration

This document extends the IANA "RTCP XR Block Type Registry" by two new values: DRLE and BDR.

[Note to RFC Editor: please replace DRLE and BDR with the IANA provided RTCP XR block type for this block here and in the diagrams above.]

8.2. SDP Parameter Registration

This document registers two new parameters for the Session Description Protocol (SDP), "discard-rle" and "discard-bytes", in the "RTCP XR SDP Parameters Registry".

8.3. Contact information for IANA registrations

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RTCP XR Blocks for multimedia quality metric reporting
draft-wu-xrblock-rtcp-xr-quality-monitoring-04

Abstract

This document defines an RTCP XR Report Block and associated SDP parameters that allow the reporting of multimedia quality 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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1. Introduction

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

The new block type provides information on multimedia quality using one of several standard metrics.

The metrics belong to the class of application level metrics defined in [MONARCH] (work in progress).

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].

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 0xffffe 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. Applicability

The Multimedia Quality Metrics Report Block can be used in any real-time AV application.

The factors that affect real-time AV application quality can be split into two categories. The first category consists of transport-dependent factors such as packet loss, delay and jitter (which also translates into losses in the playback buffer). The factors in the second category are application-specific factors that affect real time application (e.g., video) quality and are sensitivity to network

errors. These factors can be but not limited to video codec and loss recovery technique, coding bit rate, packetization scheme, and content characteristics.

Compared with application-specific factors, the transport-dependent factors sometimes are not sufficient to measure real time data quality, since the ability to analyze the real time data in the application layer provides quantifiable measurements for subscriber Quality of Experience (QoE) that may not be captured in the transmission layers or from the RTP layer down. In a typical scenario, monitoring of the transmission layers can produce statistics suggesting that quality is not an issue, such as the fact that network jitter is not excessive. However, problems may occur in the service layers leading to poor subscriber QoE. Therefore monitoring using only network-level measurements may be insufficient when application layer content quality is required.

In order to provide accurate measures of real time application quality when transporting real time contents across a network, the synthetical multimedia quality Metrics is highly required which can be conveyed in the RTCP XR packets[RFC3611] and may have the following three benefits:

- o Tuning the content encoder algorithm to satisfy real time data quality requirements
- o Determining which system techniques to use in a given situation and when to switch from one technique to another as system parameters change
- o Verifying the continued correct operation of an existing system

4. Synthetical Multimedia Quality Metrics Block

This block reports the multimedia application performance or quality beyond the information carried in the standard RTCP packet format. Information is recorded about multimedia application QoE metric which provides a measure that is indicative of the user's view of a service. Multimedia application QoE metric is commonly expressed as a MOS ("Mean Opinion Score"), MOS is on a scale from 1 to 5, in which 5 represents excellent and 1 represents unacceptable. MOS scores are usually obtained using subjective testing or using objective algorithm. However Subjective testing to estimate the multimedia quality may be not suitable for measuring the multimedia quality since the results may vary from test to test. Therefore using objective algorithm to calculate MOS scores is recommended. ITU-T recommendations define the methodologies for assessment of the performance of multimedia stream [G.107][P.564][G.1082][P.NAMS][P.NBAMS] and provides a method to

evaluate QoE estimation algorithms and objective model for video and audio. Hence this document recommends vendors and implementers to use these International Telecommunication Union (ITU)-specified methodologies to measure parameters when possible.

4.1. Metric Block Structure

The report block contents are dependent upon a series of flag bits carried in the first part of the header. Not all parameters need to be reported in each block. Flags indicate which are and which are not reported. The fields corresponding to unreported parameters MUST be present, but are set to zero. The receiver MUST ignore any Perceptual Quality Metrics Block with a non-zero value in any field flagged as unreported.

The Synthetical Multimedia Quality Metrics 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								I	MC								Rsd.								block length							
SSRC of source																																
Rsv.																MOS Value																

4.2. Definition of Fields in Multimedia Quality Metrics Block

Block type (BT): 8 bits

The Synthetical Multimedia Quality Metrics Block is identified by the constant <SMQM>.

Interval Metric flag (I): 1 bit

This field is used to indicate whether the Basic Loss/Discard metrics are Interval or Cumulative metrics, that is, whether the reported values applies to the most recent measurement interval duration between successive metrics reports (I=1) (the Interval Duration) or to the accumulation period characteristic of cumulative measurements (I=0) (the Cumulative Duration).

MoS Type (MT): 4 bits

This field is used to indicate the MOS type to be reported. The MOS type is defined as follows:

- 0000 MOS-LQ - Listening Quality MoS.
- 0001 MOS-CQ - Conversation Quality MoS.
- 0010 MOS-V - Video Quality MOS.
- 0011 MOS-AV - Audio-Video Quality MOS.
- 0100~1111 - Reserved for future definitions.

MoS-LQ measures the quality of audio for listening purposes only while MoS-CQ measures the quality of audio for conversation purpose only. MoS-V and MoS-AV measures the quality of video application or Audio-Video application. Both MoS-LQ and MoS-CQ are commonly used in VoIP applications. MOS-LQ uses either wideband audio codec or narrowband audio codec, or both and does not take into account any of bidirectional effects, such as delay and echo. MOS-CQ uses narrowband codec and takes into account listening quality in each direction, as well as the bidirectional effects. If MoS type is MoS-LQ and MoS-CQ, the MoS value can be calculated based on ITU-T G.107[G.107], ITU-T P.564 [P.564] or ETSI TS 101 329-5 [ETSI], if the MoS type is MoS-V or MoS-AV, the MoS value can be calculated based on ITU-T P.NAMS [P.NAMS] or ITU-T P.NBAMS [P.NBAMS]. If new MOS types are defined, they can be added by an update to this document. If the receiver does not understand the MOS type defined in this document it should discard this report.

Rsd.: 3 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 length of this report block in 32-bit words, minus one. For the Packet Delay Variation Metrics block, the block length is equal to 2.

SSRC of source: 32 bits

As defined in Section 4.1 of [RFC3611].

Rsd.:16 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.

MOS Value: 16 bits

The estimated mean opinion score for multimedia application quality is defined as including the effects of delay, loss, discard, jitter and other effects that would affect multimedia quality. It is expressed in numeric format 8:8 with the value in the range 0.0 to 255.996. The valid the measured value ranges from 0.0 to 50.0, corresponding to MoS x 10 as for MoS. If the measured value is over ranged, the value 0xFFFFE SHOULD be reported to indicate an over-range measurement. If the measurement is unavailable, the value 0xFFFF SHOULD be reported. Values other than 0xFFFFE, 0xFFFF and the valid range defined above MUST NOT be sent and MUST be ignored by the receiving system.

5. SDP Signaling

One new parameter is defined for the report block defined in this document to be used with Session Description Protocol (SDP) [RFC4566] using the Augmented Backus-Naur Form (ABNF) [RFC5234]. It has the following syntax within the "rtcp-xr" attribute [RFC3611]:

```
rtcp-xr-attr = "a=rtcp-xr:"  
               [xr-format *(SP xr-format)] CRLF  
xr-format = multimedia-quality-metrics  
multimedia-quality-metrics = "multimedia-quality-metrics"
```

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 report block types for RTCP XR are subject to IANA registration. For general guidelines on IANA allocations for RTCP XR, refer to Section 6.2 of [RFC3611].

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

Name: SMQM
Long Name: Synthetical Multimedia Quality Metric
Value: <SMQM>
Reference: Section 4

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

* "multimedia-quality-metrics"

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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Appendix A. Change Log

A.1. draft-wu-xrblock-rtcp-xr-quality-monitoring-03

The following are the major changes compared to previous version 02:

- o Remove the tag field.
- o Define MOS Value field as 32 bits integer value field.
- o Clear unused references.
- o Add text to MOS type field for clarification.
- o Other Editorial changes.

A.2. draft-wu-xrblock-rtcp-xr-quality-monitoring-04

The following are the major changes compared to previous version 03:

- o Add Numeric format definition and express the MoS-Value in Numeric format.

- o Change 32bits MoS Value into 16bits MoS Value.
- o Add some text to MoS Type definition to clarify the algorithm calculation.
- o Separate MoS-A into MoS-LQ and MoS-CQ and add some text to clarify the difference between them.
- o Add one more reference for MoS-LQ and MoS-CQ value calculation.
- o Other Editorial changes.

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RTCP XR Blocks for layered Stream statistics metric reporting
draft-xia-xrblock-rtcp-xr-layered-statistics-01

Abstract

This document defines an RTCP XR Report Block and associated SDP parameters that allow the reporting of layered stream 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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1. Introduction

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

The new block type provides layered streams 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 layered component packets, duplicated layered component packets.

The metrics belong to the class of transport level metrics defined in [MONARCH] (work in progress).

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:

Layered Component Packet

a RTP packet using layered codecs containing the specified layered component, e.g., encoded stream at the base layer or at the enhancement layer.

3. Applicability

Layered Streams Statistics Metrics Block can be applied to any real time applications that use layered or multi-description video coding.

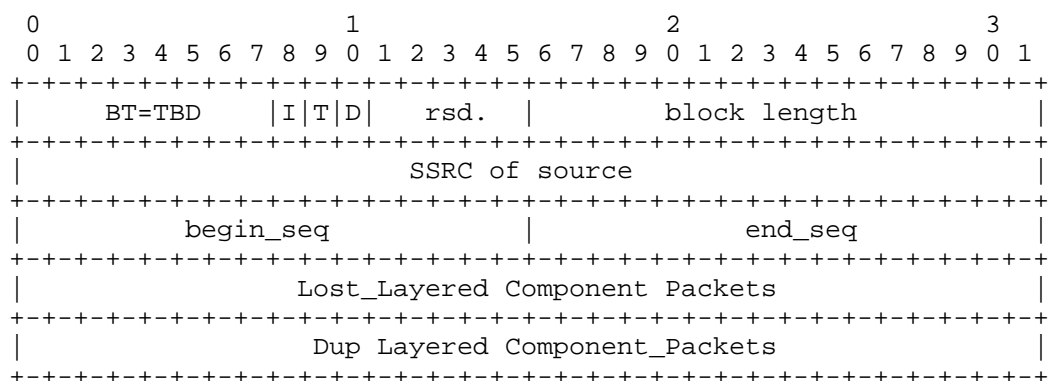
4. Layered Streams Statistics Metrics Block

Metrics in this block report on lost packets, duplicated packets in the layered stream arriving at the RTP system.

4.1. Metric Block Structure

The report block contents are dependent upon a series of flag bits carried in the first part of the header. Not all parameters need to be reported in each block. Flags indicate which are and which are not reported. The fields corresponding to unreported parameters **MUST** be present, but are set to zero. The receiver **MUST** ignore any Perceptual Quality Metrics Block with a non-zero value in any field flagged as unreported.

The Layered Stream Statistics metrics Block has the following format:



4.2. Definition of Fields in layered stream statistics Metrics Block

Block type (BT): 8 bits

The Layered stream Statistics Metrics Block is identified by the constant <LSSM>.

Interval Metric flag (I): 1 bit

This field is used to indicate whether the Basic Loss/Discard metrics are Interval or Cumulative metrics, that is, whether the reported values applies to the most recent measurement interval duration between successive metrics reports (I=1) (the Interval Duration) or to the accumulation period characteristic of cumulative measurements (I=0) (the Cumulative Duration).

Layer Type flag (T): 1 bit

This field is used to indicate the Layer Type of layered video to be reported. LT is set to 0 if the loss_component_packet field and dup_component packet contain the base layer packet in layered codecs, e.g., SVC in [RFC6190], 1 if the loss_component packet field and dup_component packet contain enhancement layer packet in layered codec.

Layer Dependency (D): 1 bit

This field is used to indicate the layer dependency between different enhancement layers if there is more than one enhancement layers. D is set to 0 if there is no layer dependency between different enhancement layers, 1 if there is layer dependency between different enhancement layers.

Rsd.: 5 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].

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].

Lost_Layered Component Packets: 32 bits

Number of lost_component packets in the above sequence number interval.

Dup_Layered Component Packets: 32 bits

Number of dup_component packets in the above sequence number interval.

5. SDP Signaling

One new parameter is defined for the report block defined in this document to be used with Session Description Protocol (SDP) [RFC4566] using the Augmented Backus-Naur Form (ABNF) [RFC5234]. It has the following syntax within the "rtcp-xr" attribute [RFC3611]:

```
rtcp-xr-attrib = "a=rtcp-xr:"  
                [xr-format *(SP xr-format)] CRLF  
                xr-format = layered-stream-stat-metrics  
                layered-stream-stat-metrics = "layered-stream-stat-metrics"  
                ["=" stat-flag *("," stat-flag)]  
                stat-flag = "base layer packet"  
                / "enhancement layer packet"
```

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 report block type for RTCP XR is subject to IANA registration. For general guidelines on IANA allocations for RTCP XR, refer to Section 6.2 of [RFC3611].

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

Name:	LSSM
Long Name:	Layered Stream Statistics Metrics
Value	<LSSM>
Reference:	Section 4

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

* "layered-stream-stat-metrics"

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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

The authors would like to thank Bill Ver Steeg, David R Oran, Ali Begen, Colin Perkins, Roni Even, Youqing Yang, Wenxiao Yu and Yinliang Hu for their valuable comments and suggestions on this document.

9. References

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Appendix A. Change Log

A.1. draft-xia-xrblock-rtcp-xr-layered-statistics-01

- The following are the major changes compared to previous version 00:
- o Add the layer dependency field in the format of this metric block.
 - o Clear unused references.
 - o Other Editorial changes.

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October 13, 2011

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

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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.

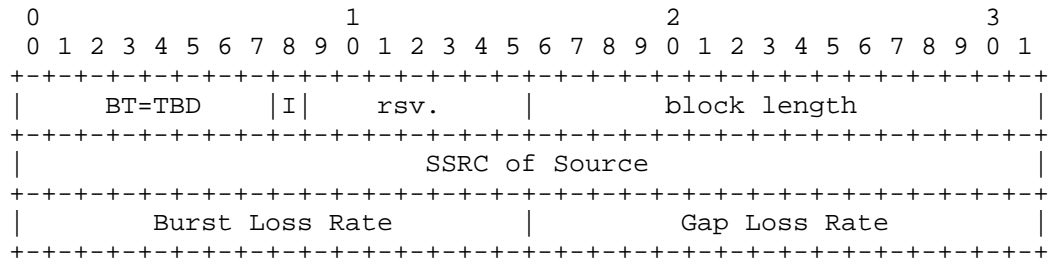
3. Transport Layer Metrics

3.1. Burst/Gap Loss Summary 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



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:

$$\text{Packets Loss in Bursts} / \text{Total Packets expected in Bursts}$$

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:

$$(\text{number of packets lost} - \text{Packets Lost in Bursts}) / (\text{Packets Expected} - \text{Total Packets expected in Bursts})$$

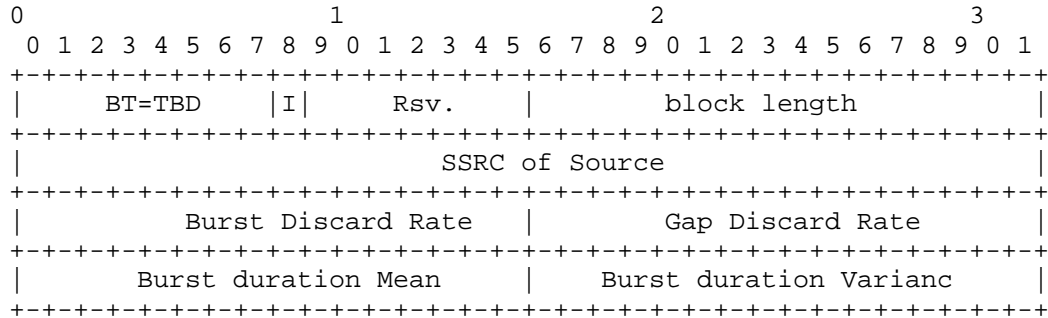
where "number of packets lost" is obtained from standard RTCP [RFC3550] and Packets Expected is calculated as the difference between "extended last sequence number" and "extended first sequence number" (Interval or Cumulative) provided in the Measurement Identity and Information block [MEASIDENT].

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



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:

$$\text{Packets Discarded in Bursts} / \text{Total Packets expected in Bursts}$$

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:

$$(\text{number of packets discarded} - \text{Packets Discarded in Bursts}) / (\text{Packets Expected} - \text{Total Packets expected in Bursts})$$

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:

$$\text{mean} = \text{Sum of Burst Durations} / \text{Number of Bursts}$$

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:

$$\text{var} = (\text{Sum of Squares of Burst Durations} - \text{Number of Bursts} * \text{mean}^2) / (\text{Number of Bursts} - 1)$$

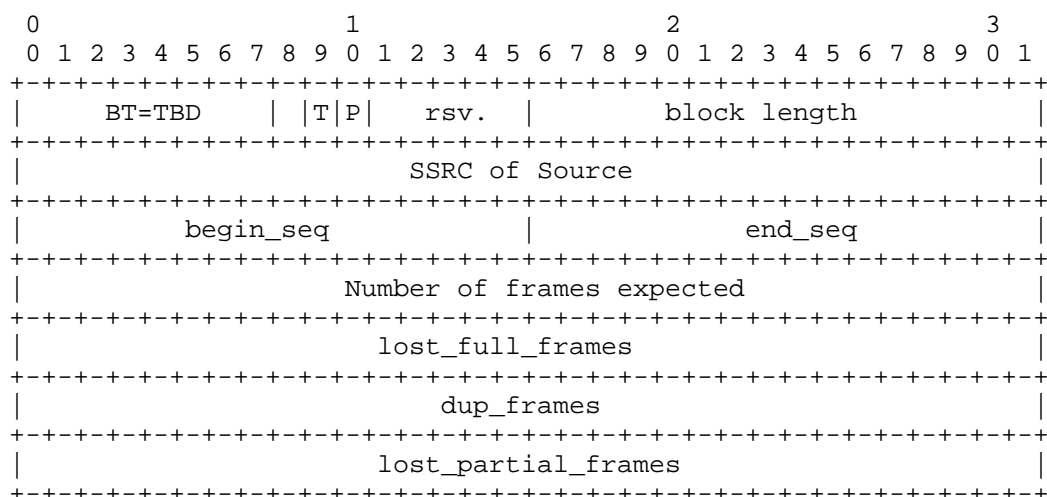
where " Sum of Squares of Burst Durations " and "Number of Bursts" is obtained from the RTCP XR Burst/Gap Discard Block.

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



4.1.2. Definition of Fields in Loss/Duplication Summary Statistics Block

Block type (BT): 8 bits

Application Layer Loss/Duplication Statistics Summary Block 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

The authors would like to thank Bill Ver Steeg, David R Oran, Ali Begen, Colin Perkins, Roni Even, Youqing Yang, Wenxiao Yu and Yinliang Hu for their valuable comments and suggestions on this document.

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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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