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RTCP XR for Summary Statistics Metrics Reporting
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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.

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1. Introduction

This draft defines three new block types to augment those defined in [\[RFC3611\]](#) for use in a range of RTP applications.

The first two block types support the reporting of burst gap loss/discard, summary statistics including packet loss/discard proportion, mean and variance and belong to the class of transport layer metrics defined in [\[MONARCH\]](#). These two blocks are intended to be used in conjunction with information from the Burst Gap Loss metric block or burst gap discard metric block, and on which these two block therefore depends. However the metrics in the Burst Gap Loss block or burst gap discard block may be used independently of the metrics defined in the first two blocks.

To form an accurate assessment of user quality of experience, it is therefore necessary to know not just overall rates of packet loss/discard, but also which frame type were affected. The third block supports the reporting of detailed statistics for each frame type, including the number of received, lost and discarded of each frame type in the Group of Pictures and additional data allowing the calculation of statistical parameters (e.g., the proportion of each frame type impaired by packet loss and discard). The metrics defined in this block belong to the class of application layer metrics defined in [\[MONARCH\]](#).

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 [[MEASIDENT](#)] (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 provide information relevant to statistical parameters, including burst loss rate, gap loss rate, burst duration mean, burst duration variance and are calculated using burst gap loss metrics defined in [[BGLSS](#)] and other information which is sent together with this report block.

3.1.1. Report Block Structure

0								1								2								3							
0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1
BT=BGLSS								I		rsv.								block length													
SSRC of Source																															
Burst Loss Rate																Gap Loss Rate															
Burst duration Mean																Burst duration Variance															

3.1.2. Definition of Fields in Loss Summary Statistics Block

Block Type (BT): 8 bits

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

Interval Metric flag (I): 2 bits

This field is used to indicate whether the Burst/Gap Loss Summary Statistics metrics are Sampled, Interval or Cumulative metrics, that is, whether the reported values applies to the most recent measurement interval duration between successive metrics reports (I=10) (the Interval Duration) or to the accumulation period characteristic of cumulative measurements (I=11) (the Cumulative Duration) or is a sampled instantaneous value (I=01) (Sampled Value).

Reserved: 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 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 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 Loss 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.

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 Loss Block [BGLLOSS].

Burst Duration Variance:16bits

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

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

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

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 [[MEASIDENT](#)] (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.

These metrics provide information relevant to statistical parameters, including burst discard rate, gap discard rate and are calculated using burst gap loss metrics defined in [\[BGDISCARD\]](#) and other information which is sent together with this report block.

3.2.1. Report Block Structure

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=BGDSS										I		Rsv.					block length														
+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
										SSRC of Source																					
+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Burst Discard Rate												Gap Discard Rate																			
+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-

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): 2 bits

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

Reserved: 6 bits

This field is used to indicate whether the Burst/Gap Discard Summary Statistics metrics are Sampled, Interval or Cumulative metrics, that is, whether the reported values applies to the most recent measurement interval duration between successive metrics reports (I=10) (the Interval Duration) or to the accumulation period characteristic of cumulative measurements (I=11) (the Cumulative Duration) or is a sampled instantaneous value (I=01) (Sampled Value).

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 Discard Rate: 16 bits

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

Packets Discarded in Bursts / Total Packets expected in Bursts

Gap Discard Rate: 16 bits

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

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

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](#)].

[4.](#) Application Layer Metrics

[4.1.](#) Frame Impairment Statistics Summary Block

This block reports statistics on which frame type were affected 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 number of frames received, lost frames, duplicated frames, lost partial frames. Such information can be useful for network management and video quality monitoring.

4.1.1. Report Block Structure

```

      0               1               2               3
      0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      BT=FISS      |T|      rsv.      |      block length      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                     SSRC of Source                                     |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      begin_seq      |      end_seq      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      Number of frames received      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      discarded_frames      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      dup_frames      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      lost_full_frames      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|      lost_partial_frames      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

4.1.2. Definition of Fields in Frame Impairment Summary Statistics Block

Block type (BT): 8 bits

Frame Impairment Statistics Summary Block is identified by the constant <FISS>.

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. Note that if both the key frame report and derivation frame are sent, they should be sent in the same RTCP compound packet using two XR Blocks.

Rsv.: 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 7, 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 received:32bits

A count of the number of frames received, 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.

discarded_frames: 32 bits

Number of frames discarded in the above sequence number interval.

dup_frames: 32 bits

Number of duplicated 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-attrb = "a=rtcp-xr:"  
                [xr-format *(SP xr-format)] CRLF  
xr-format =  
            / burst-gap-loss-stat  
            / burst-gap-discard-stat  
            / frame-impairment-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:	FISS
Long Name:	Frame Impairment Statistics Summary
Value	<FISS>
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 "
- * " frame-impairment-stat "

6.3. Contact information for registrations

The contact information for the registrations is:

Glen Zorn
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227/358 Thanon Sanphawut
Bang Na, Bangkok 10110
Thailand

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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9. References

9.1. Normative References

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- [RFC3550] Schulzrinne, H., Casner, S., Frederick, R., and V. Jacobson, "RTP: A Transport Protocol for Real-Time Applications", STD 64, [RFC 3550](#), July 2003.
- [RFC3611] Friedman, T., Caceres, R., and A. Clark, "RTP Control Protocol Extended Reports (RTCP XR)", [RFC 3611](#), November 2003.

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

9.2. Informative References

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- [MONARCH] Wu, Q., "Monitoring Architecture for RTP", ID [draft-ietf-avtcore-monarch-10](#), February 2012.
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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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