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RTCP XR Report Block for Burst/Gap Loss metric Reporting
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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.

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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] .

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 document defines a new Extended Report block. The use of Extended Report blocks is defined by [RFC3611].

1.3. Performance Metrics Framework

The Performance Metrics Framework [RFC6390] 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 [RFC6390].

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

Burst/Gap Loss metrics block

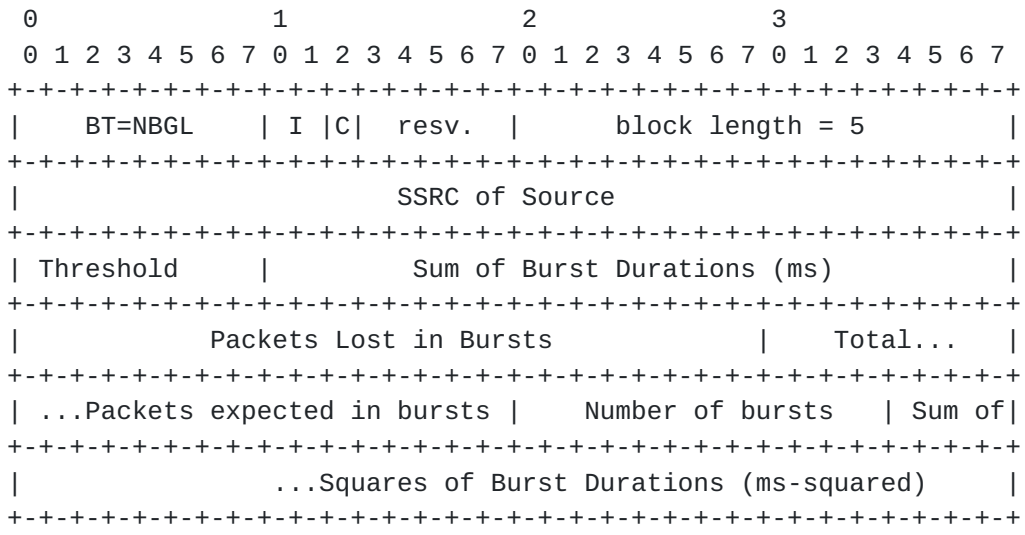


Figure 1: Report Block Structure

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): 2 bit

This field is used to indicate whether the Burst/Gap Loss 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).

Loss and Discard Combination flag (C): 1 bit

The 'C' flag is used to indicate whether combining loss/discard report is needed. This field MUST be set to '1' if the burst gap loss report is present in conjunction with the burst gap discard report in the same compound RTCP packet and MUST be set to '0' otherwise. If the burst gap discard is not sent with burst gap loss, then the receiver should discard burst gap loss with 'C' flag set to 1. If the 'C' flag is set to 0, then receiver should not discard burst gap loss metric block when burst gap discard is not received.

Reserved (resv): 5 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 packet in order for this lost packet to be regarded as part of a gap.

Sum of Burst Durations (ms): 24 bits

The total duration of bursts of lost packets 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 0xFFFFFF 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 0xFFFFFF 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 0xFFFFFF 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 0xFFFD, the value 0xFFFE 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 0xFFFFFFFFF 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 [MEASID] (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:

- The fraction of packets lost during bursts (i.e., Burst Loss Rate in [SUMSTAT])
- The fraction of packets lost during gaps (i.e., Gap Loss Rate in [SUMSTAT])
- burst duration mean [SUMSTAT]
- burst duration variance [SUMSTAT]

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 packets had been sent, i.e. a period of silence in excess of Gmin packets 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 [PSES].

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:

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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

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