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RTP Control Protocol (RTCP) Extended Report (XR) Block for Discard Count Metric Reporting

Abstract

This document defines an RTP Control Protocol (RTCP) Extended Report (XR) block that allows the reporting of a simple discard count metric for use in a range of RTP applications.

Status of This Memo

This is an Internet Standards Track document.

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1. Introduction

1.1. Discard Count Report Block

This document 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 that are received correctly but are never played out, typically because they arrive too late (buffer underflow) or too early (buffer overflow) to be played out. The metric is applicable both to systems that use packet loss repair techniques (such as forward error correction [RFC5109] or retransmission [RFC4588]) and to those that do not.

This metric is useful for identifying the existence, and characterizing the severity, of packet transport problems that may affect users' perceptions of a service delivered over RTP.

This block may be used in conjunction with [RFC7003], which provides additional information on the pattern of discarded packets. However, the metric in [RFC7003] may be used independently of the metrics in this block.

When a Discard Count Metrics Block is sent together with a Burst/Gap Discard Metrics Block (defined in [RFC7003]) to the media sender or RTP-based network management system, the information carried in the Discard Count Metrics Block and the Burst/Gap Discard Metrics Block allows systems receiving the blocks to calculate burst/gap summary statistics (e.g., the gap discard rate).

The metric belongs to the class of transport-related end-system metrics defined in [RFC6792].

1.2. RTCP and RTCP Extended 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 for use with [RFC3550] and [RFC3611].

1.3. Performance Metrics Framework

"Guidelines for Considering New Performance Metric Development" [RFC6390] provides guidance on the definition and specification of performance metrics. "Guidelines for Use of the RTP Monitoring Framework" [RFC6792] provides guidance for reporting block format using RTCP XR. The metrics block described in this document is in accordance with the guidelines in [RFC6390] and [RFC6792].

1.4. Applicability

This metric is believed to be applicable to a large class of RTP applications that use a de-jitter buffer [RFC5481].

Discards due to late or early arriving packets affect user experience. The reporting of discards alerts senders and other receivers to the need to adjust their transmission or reception strategies. The reports allow network managers to diagnose these user experience problems.

The ability to detect duplicate packets can be used by managers to detect network layer or sender behavior, which may indicate network or device issues. Based on the reports, these issues may be addressed prior to any impact on user experience.

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 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 either too early or too late to be played out or is thrown away before playout due to packet duplication or redundancy shall be regarded as discarded. A packet shall not be regarded as discarded if it arrives within this time window but is dropped during decoding by some higher layer decoder, e.g., due to a decoding error. A packet shall be classified as one of the following: received (or OK), discarded, or lost. The discard count 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 synchronization source (SSRC) within a single RTP session). Similarly, the metric "number of packets discarded" reports a count of packets discarded from the media stream (single SSRC within a single RTP session) arriving at the receiver. Another metric defined in [RFC5725] is available to report on packets that are not recovered by any repair techniques that may be in use.

3. Discard Count Metrics Block

Metrics in this block report on the number of packets discarded in the stream arriving at the RTP end system. The measurement of these metrics is made at the receiving end of the RTP stream. Instances of this metrics block use the SSRC to refer to the separate auxiliary Measurement Information Block [RFC6776], which describes measurement periods in use (see [RFC6776], Section 4.2). This metrics block relies on the measurement interval in the Measurement Information Block indicating the span of the report and MUST be sent in the same compound RTCP packet as the Measurement Information Block. If the measurement interval is not received in the same compound RTCP packet as this metrics block, this metrics block MUST be discarded.

3.1. Report Block Structure

The structure of the Discard Count Metrics Block is as follows.

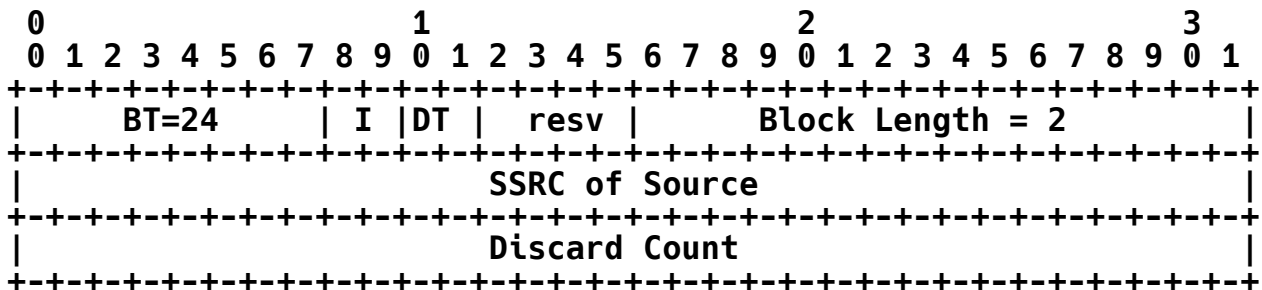


Figure 1: Report Block Structure

3.2. Definition of Fields in the Discard Count Metrics Block

Block Type (BT): 8 bits

A Discard Count Metrics Block is identified by the constant 24.

Interval Metric flag (I): 2 bits

This field indicates whether the reported metric is an Interval, Cumulative, or Sampled metric [RFC6792]:

I=10: Interval Duration - the reported value applies to the most recent measurement interval duration between successive metrics reports.

I=11: Cumulative Duration - the reported value applies to the accumulation period characteristic of cumulative measurements.

I=01: Sampled Value - the reported value is a sampled instantaneous value.

In this document, the discard count metric can only be measured over definite intervals and cannot be sampled. Accordingly, the value I=01, indicating a sampled value, **MUST NOT** be sent, and **MUST** be discarded when received. In addition, the value I=00 is reserved and also **MUST NOT** be sent, and **MUST** be discarded when received.

Discard Type (DT): 2 bits

This field is used to identify the discard type used in this report block. The discard type is defined as follows:

00: Report packet discarded or being thrown away before playout due to packet duplication.

01: Report packet discarded due to too early to be played out.

10: Report packet discarded due to too late to be played out.

The value DT=11 is reserved for future definition and MUST NOT be sent, and MUST be discarded when received.

An endpoint MAY report any combination of discard types in each reporting interval by including several Discard Count Metrics Blocks in a single RTCP XR packet.

Some systems send duplicate RTP packets for robustness or error resilience. This is NOT RECOMMENDED since it breaks RTCP packet statistics. If duplication is desired for error resilience, the mechanism described in [RTPDUP] can be used, since this will not cause breakage of RTP streams or RTCP statistics.

Reserved (resv): 4 bits

These bits are reserved. They MUST be set to zero by senders and ignored by receivers (see [RFC6709], Section 4.2).

Block Length: 16 bits

The length of this report block in 32-bit words, minus one, in accordance with the definition in [RFC3611]. This field MUST be set to 2 to match the fixed length of the report block. The block MUST be discarded if the block length is set to a different value.

SSRC of Source: 32 bits

As defined in Section 4.1 of [RFC3611].

Discard Count

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

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

Note that the number of packets expected in the period associated with this metric (whether Interval or Cumulative) is available from the difference between a pair of extended sequence numbers in the Measurement Information Block [RFC6776], so it need not be repeated in this block.

4. SDP Signaling

[RFC3611] defines the use of the Session Description Protocol (SDP) [RFC4566] for signaling the use of XR blocks. However, XR blocks MAY be used without prior signaling (see Section 5 of RFC 3611).

4.1. SDP rtcp-xr Attribute Extension

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. The ABNF [RFC5234] syntax is as follows.

```
xr-format =/ xr-pdc-block
xr-pdc-block = "pkt-discard-count"
```

4.2. Offer/Answer Usage

When SDP is used in Offer/Answer context, the SDP Offer/Answer usage defined in [RFC3611] for unilateral "rtcp-xr" attribute parameters applies. For detailed usage of Offer/Answer for unilateral parameters, refer to Section 5.2 of [RFC3611].

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 24 in the IANA "RTP Control Protocol Extended Reports (RTCP XR) Block Type Registry" to the "Discard Count Metrics Block".

5.2. New RTCP XR SDP Parameter

This document also registers a new parameter "pkt-discard-count" in the "RTP Control Protocol Extended Reports (RTCP XR) Session Description Protocol (SDP) Parameters Registry".

5.3. Contact Information for Registrations

The following contact information is provided for all registrations in this document:

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6. Security Considerations

In some situations, returning very detailed error information (e.g., over-range measurement or measurement unavailable) using this report block can provide an attacker with insight into the security processing. Where this is a concern, the implementation should apply encryption and authentication to this report block. For example, this can be achieved by using the Audio-Visual Profile with Feedback (AVPF) profile together with the Secure RTP profile, as defined in [RFC3711]; an appropriate combination of those two profiles ("SAVPF") is specified in [RFC5124].

Besides this, it is believed that this RTCP XR 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

Geoff Hunt wrote the initial draft of this document.

8. Acknowledgments

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Appendix A. Metrics Represented Using the Template from RFC 6390**a. Number of Packets Discarded Metric**

- * **Metric Name:** Number of RTP packets discarded.
- * **Metric Description:** Number of RTP packets discarded over the period covered by this report.
- * **Method of Measurement or Calculation:** See Section 3.2, Discard Count definition.
- * **Units of Measurement:** See Section 3.2, Discard Count definition.
- * **Measurement Point(s) with Potential Measurement Domain:** See Section 3, 1st paragraph.
- * **Measurement Timing:** See Section 3, 1st paragraph for measurement timing and Section 3.2 for Interval Metric flag.
- * **Use and Applications:** See Section 1.4.
- * **Reporting Model:** See RFC 3611.

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