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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

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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 0xfffe 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 synthentical 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

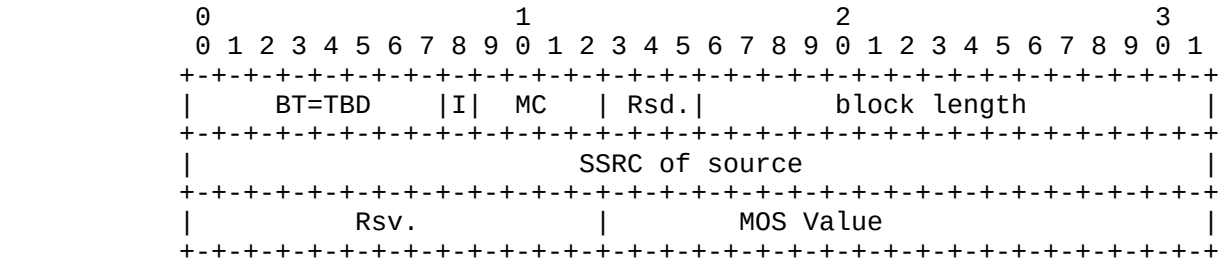
This block reports the multimedia application performance or quality beyond the information carried in the standard RTCP packet format. Information is recorded about multimedia application QoE metric which provides a measure that is indicative of the user’s view of a service. Multimedia application QoE 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:



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 0xFFFE SHOULD be reported to indicate an over-range measurement. If the measurement is unavailable, the value 0xFFFF SHOULD be reported. Values other than 0xFFFE,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-attrib =  "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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9. References

9.1. 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.

[RFC5234] Crocker, D. and P. Overell, "Augmented BNF for Syntax

Specifications: ABNF", STD 68, RFC 5234, January 2008.

9.2. Informative References

[ETSI] ETSI, "Quality of Service (QoS) measurement methodologies", ETSI TS 101 329-5 V1.1.1, November 2000.

[G.107] ITU-T, "The E Model, a computational model for use in transmission planning", ITU-T Recommendation G.107, April 2009.

[G.1082] ITU-T, "Measurement-based methods for improving the robustness of IPTV performance", ITU-T Recommendation G.1082, April 2009.

[MONARCH] Wu, Q., "Monitoring Architectures for RTP", ID draft-ietf-avtcore-monarch-00, April 2011.

[P.564] ITU-T, "Conformance testing for narrowband Voice over IP transmission quality assessment models", ITU-T Recommendation P.564, July 2006.

[P.NAMS] ITU-T, "Non-intrusive parametric model for the Assessment of performance of Multimedia Streaming", ITU-T Recommendation P.NAMS, November 2009.

[P.NBAMS] ITU-T, "non-intrusive bit-stream model for assessment of performance of multimedia streaming", ITU-T Recommendation P.NBAMS, November 2009.

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:

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

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

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

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

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

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