Abstract

This document defines extensions to the RTCP XR extended report packet type blocks to support the monitoring of video over IP for IPTV and videoconferencing endpoint reporting. [Note that the audio and transport metric report blocks contained in the -00 draft have been moved to separate drafts.]
1. Introduction

This draft defines an RTCP XR block type for Quality of Service reporting for video over IP. It is intended to support both the identification of problems affecting performance and the collection of data that may be useful in optimizing system configuration.

Video performance may be measured using zero (no) reference, partial (reduced) reference or full reference. The primary application of this draft is to support the reporting of real-time, in-service performance obtained using a zero or partial reference model however this approach could also be used to support the remote reporting of metrics from a full reference test.

2. Definitions
### Metric definitions

**3.2.1 Header**

The header comprises:

(i) Block Type for this report block
(ii) Reserved (set to 0xFF)
(iii) Block length in words (set to 0x000D)
(iv) SSRC of the received RTP stream that this report refers to
(v) Program ID (PID) for the video stream (if MPEG Transport encapsulation is used)
(vi) Reserved (set to 0xFFFF)

**3.2.2 Report Timestamp**

The time at which this report was generated (format?)

**3.2.3 Measurement Interval**

The interval of time over which these metrics were measured, expressed in milliseconds.

**3.2.4 Proportion of impaired I frames**

The proportion of I (intra-frame encoded) frames that were impaired by packet loss or discard, expressed as a binary fraction.
3.2.5 Proportion of impaired BP frames
The proportion of B and P (inter-frame encoded) frames that were impaired by packet loss or discard, expressed as a binary fraction.

3.2.6 Loss rate within I frames
The average packet loss/discard rate occurring within I frames, expressed as a binary fraction.

3.2.7 Loss rate within BP frames
The average packet loss/discard rate occurring within B and P frames, expressed as a binary fraction.

3.2.8 Mean inter-I-frame gap (MIIF)
The average interval between I frames expressed in terms of frames. If \( n(j) \) is the number of P and B frames between the \( j \)th and \( (j+1) \)th I frame then the mean inter-I-frame gap is

\[
MIIF(j) = \frac{MIIF(j-1) \times 15 + n(j)}{16}
\]

The I frames occur at the start of Groups of Pictures (GoP) and may also be inserted during GoP’s due to large scale changes in picture content (e.g. scene changes). This can result in bandwidth being larger than expected.

3.2.9 Max GoP Length (MGoP)
The maximum GoP size (including the starting I frame and subsequent P and B frames) expressed in terms of frames. If \( m(j) \) comprises a count of the starting I frame and the subsequent frames (P, B or inserted I) prior to the I frame that forms the start of the next GoP, then the maximum GoP length is

\[
MGoP(j) = \max( m(j), MGoP(j-1) )
\]

A long GoP may result in lower bandwidth however will lead to increased error propagation and hence degraded performance.

3.2.10 Mean Estimated MOS-V
An estimate of video quality expressed as a Mean Opinion Score, averaged over the duration of the measurement interval. This is expressed in unsigned 8:8 format and has the range 1.0 to 5.0.

A value of 0xFFFF shall indicate that this parameter is not available.

[Add references to ATIS IIF, VQEG, ITU SG12/9]

3.2.11 Estimated PSNR
An estimate of the average Peak Signal to Noise Ratio, averaged over the duration of the measurement interval. This is expressed in unsigned 8:8 format and has the range 0.0 to 100.0. For typical high quality video streams this parameter would have a value in the range 35-45.
A value of 0xFFFF shall indicate that this parameter is not available.

[Add references to ATIS IIF]

3.2.12 MOS Threshold
Threshold defined as the level below which quality is not acceptable

A value of 0xFFFF shall indicate that this parameter is not available.

3.2.13 Proportion of time below MOS threshold
The proportion of the measurement interval during which estimated MOS was below the MOS Threshold, expressed as a binary fraction.

If the value of MOS Threshold is 0xFFFF then the value of this parameter is undefined.

3.2.14 EPSNR Threshold
Threshold defined as the level below which quality is not acceptable

A value of 0xFFFF shall indicate that this parameter is not available.

3.2.15 Proportion of time below EPSNR threshold
The proportion of the measurement interval during which estimated PSNR was below the PSNR Threshold, expressed as a binary fraction.

If the value of MOS Threshold is 0xFFFF then the value of this parameter is undefined.

3.2.16 Mean Video Bit Rate
The average video bit rate calculated over the measurement interval. This shall include RTP and MPEG Transport packet headers and payloads but shall exclude IP and UDP or TCP overhead.

3.2.17 Round Trip Delay
The Round Trip Delay between the originating and terminating ends of this RTP stream, expressed in milliseconds. In unicast or multicast applications this parameter may be set to "undefined" (0xFFFF).

3.2.18 A-V Delay
The relative delay between decoded audio and video streams expressed in milliseconds.

3.2.19 Playout Interrupt Count
The number of interruptions that occurred during playout, due to either packet loss or buffer underrun.

3.2.20 Mean Playout Interrupt Size
The mean duration of interruptions in playout expressed in milliseconds.

3.2.21 Video Playout Buffer Size
The available playout buffer size, expressed in milliseconds.

3.2.22 Mean Buffer Level
The mean playout buffer size, expressed in milliseconds.

4. Summary

This draft defines an RTCP XR report block for video quality reporting. This is intended for in-service monitoring of video streaming, IPTV and IP videoconferencing services to provide real time performance feedback and support performance management.

5. IANA Considerations

The block type "mmm" will need to be replaced with an IANA assigned number within those allocated for RTCP XR report blocks (RFC 3611).

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 endpoints. As a result, any third party wishing to obtain this information should be properly authenticated and the information transferred securely.

7. Acknowledgments

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8. Informative References

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