International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

P.1204.3

Amendment 1

(01/2021)

SERIES P: TELEPHONE TRANSMISSION QUALITY, TELEPHONE INSTALLATIONS, LOCAL LINE NETWORKS

Models and tools for quality assessment of streamed media

Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to full bitstream information

Amendment 1: New Appendix II: Long term integration module (Pq) for ITU-T P.1204.3

Recommendation ITU-T P.1204.3 (2020) – Amendment 1

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Recommendation ITU-T P.1204.3

Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to full bitstream information

Amendment 1

New Appendix II: Long term integration module (Pq) for ITU-T P.1204.3

Summary

Amendment 1 to Recommendation ITU-T P.1204.3 introduces Appendix II, which describes a long term integration module for ITU-T P.1204.3.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T P.1204.3	2020-01-13	12	11.1002/1000/14156
1.1	ITU-T P.1204.3 (2020) Amd. 1	2021-01-07	12	11.1002/1000/14588

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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Recommendation ITU-T P.1204.3

Video quality assessment of streaming services over reliable transport for resolutions up to 4K with access to full bitstream information

Amendment 1

New Appendix II: Long term integration module (Pq) for ITU-T P.1204.3

1) Add the following appendix after Appendix I.

Appendix II

Long term integration module (Pq) for ITU-T P.1204.3

(This appendix does not form an integral part of this Recommendation.)

The current approach for long-term integration described in this appendix is to be considered as an intermediate solution. It has been developed based on a total of 6 databases (2 for training and 4 for validation), while the short-term video quality model (Pv) described in the normative part of this Recommendation standard was developed using 26 databases (13 for training and 13 for validation).

As a consequence of the relatively low number of long-sequence databases used, the integration module presented in this appendix does not form an integral part of the Recommendation, and is considered for information. It is planned to be superseded in the future by a more comprehensive integration module trained and validated on a higher number of databases, which is currently under development.

The streaming parameter ranges used in the training and validation tests of the long-term integration model presented in this appendix are summarized in Table II.1.

Table II.1 – Parameters range used in the tests for the development ITU-T P.1204.3 long-term integration model

Video sequence duration	60 seconds – 5 minutes
Initial loading delay	0-30 seconds
Total stalling duration	0-26 seconds
Number of stalling events	0-5
Total number of quality level switches	0-39

The ranges of parameter settings of other test factors related to each of the segments in a video session are summarized in Table 3 of this Recommendation. It should be noted that audio quality was not varied in any of the 6 tests used to train and validate the long-term integration model presented in this appendix. For the PC/TV case, the audio from the source video was encoded using 16-bit PCM with 2 channels and 48 kHz sampling frequency. For the case of mobile/tablet, an AAC codec was used for audio with a bit rate of 512 kbits/s.

II.1 Model input

The model must receive the following input signals regardless of the mode of operation:

– O.21: audio quality per output sampling interval, as specified in [b-ITU-T P.1203.2].
– O.22: video quality per output sampling interval, as specified in ITU-T P.1204.3 – see clause 7.3.
– I.14: stalling events, as described in clause 7.1 of [ITU-T P.1204].
– I.GEN: device type (either of "PC", "TV", "Mobile" or "Tablet"), as specified in [ITU-T P.1204].

II.2 Model output

The Pq model outputs the following information:

– O.23: perceptual buffering indication
– O.34: audiovisual segment coding quality per output sampling interval
– O.35: final audiovisual coding quality score
– O.46: final media session quality score

The values O.23, O.35 and O.46 will be output once per session.

The value O.34 will be output once per output sampling interval.

II.3 Model description

The long-term integration module for [ITU-T P.1204.3] is based on the existing [ITU-T P.1203.3]. Instead of using the existing ITU-T P.1203.3 model as it is, a simplified version is recommended as the long-term integration module for [ITU-T P.1204.3]. The P.1204.3 model outputs per-segment and per-second scores denoted as O.27 and O.22 respectively.

Since ITU-T P.1204.3 just outputs O.22 and O.27, [b-ITU-T P.1203.2] is used to generate the O.21 scores that will be used as input to the long-term integration module.

II.3.1 Proposed long-term integration module for ITU-T P.1204.3

The final audiovisual coding quality (O.35) that takes into account the audiovisual quality per output sampling interval (O.34) as well as any temporal effects and media length is provided by equation (18) in [ITU-T P.1203.3]. For the sake of simplicity of presentation, this is replicated here. The equation numbering follows the numbers in [ITU-T P.1203.3].

$$O.35 = O.35_{baseline} - negBias - oscComp - adaptComp \tag{18}$$

$$O.35_{baseline} = \frac{\sum_t w_1(t) \cdot w_2(t) \cdot O.34[t]}{\sum_t w_1(t) \cdot w_2(t)} \tag{19}$$

$$w_1(t) = t_1 + t_2 \cdot e^{\left(\frac{t-1}{T}\right)/t_3} \tag{20}$$

$$w_2(t) = t_4 - t_5 \cdot O.34[t] \tag{21}$$

The resulting O.35 that replaces equation (18) in [ITU-T P.1203.3] is given by

$$O.35 = O.35_{baseline}$$

It should be noted that the simplified ITU-T P.1203.3 model considered in this appendix uses the amendments related to computing O.34 and $O.46_{temp}$ in [ITU-T P.1203.3].

Besides this simplification, no changes have been applied to the coefficients or formulae otherwise. The other outputs, namely, O.23, O.34 and O.46 are calculated as recommended in [ITU-T P.1203.3]. For the coefficients of the unchanged part of [ITU-T P.1203.3] that is used by the model recommended for ITU-T P.1204.3, the user can refer to [ITU-T P.1203.3].

II.4 Performance figures

In this clause, the aggregated RMSE of the model. Aggregated RMSE is defined as:

$$RMSE = \frac{1}{W}\sum_{k=1}^{M} w_k \cdot RMSE_k$$

Where M represents the total number of (training and validation) databases, w_k and $RMSE_k$ the weight and root mean square error for database k respectively, and $W = \sum_{k=1}^{M} w_k$. Training and validation databases have different weights:

$$w_{training} = 0.1$$

$$w_{validation} = 0.9$$

Note that the numbers are reported after a final per-database mapping between the model output and the subjective scores of a database. This linear mapping is used to account for scale and bias variations between different databases.

Table II.2 – Performance of the Pq described above, based on the submitted version of ITU-T P.1204.3

RMSE	**Training**		**Validation**	
	Nr. of databases	***Nr. of Samples***	***Nr. of databases***	***Nr. of Samples***
0.4513	2	82	4	134

Table II.3 – Performance of the Pq described above, based on the standardized ITU-T P.1204.3

RMSE	**Training**		**Validation**	
	Nr. of databases	***Nr. of Samples***	***Nr. of databases***	***Nr. of Samples***
0.4623	2	82	4	134

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