Question 14/12 – Development of models and tools for multimedia quality assessment of packet-based video services

(Continuation of Question 14/12)

1   Motivation

A major challenge for emerging IP-based networks is to provide adequate Quality of Experience (QoE) and Quality of Service (QoS) for new multimedia services and applications such as internet media including over-the-top (OTT) video, and immersive video.

A number of Recommendations have been developed by Q14/12, in particular:

–   In the P.1203 series of standards, an integral model for audiovisual quality-assessment of streaming using reliable transport is described. It enables integral quality estimates for videos between 1min and 5min duration, based on short-term audio and video quality modules (Pa/P.1203.2, Pv/P.1203.1), as well as a long-term integration module (Pq/P.1203.3).

–   In the P.1204 series of standards, a set of models is described, for bitstream-, pixel-based and hybrid video quality estimation up to 4K resolution, and covering the codecs H.264, HEVC and VP9. It is the first activity of its kind to cover all types of relevant video-quality modelling approaches, using an identical dataset for training and validation. Performance figures for the models are indicating their strong prediction power.

Both of these standard series can be used for monitoring adaptive streaming services (such as HLS or DASH), both for TCP or QUIC-type transport. Hence, they represent tools widely applicable in the market.

A primary aspect of the continued work is on the inclusion of long-term integration in conjunction with the existing P.1203 and P.1204 standards series. This work has started and is continued here, aiming for a harmonized view on longer-term session quality for the case of adaptive-streaming type services.

Moreover, the inclusion of further video codecs in updates or extensions of the P.1203 and P.1204 standards will be addressed.

Since today's over-the-top services increasingly involve encrypted transport, mid-network quality monitoring becomes more and more challenging. Bitstream or media-related information may not be readily available, and respective monitoring algorithms may need to apply heuristics. If network operators wish to assess the quality of the media services offered over their networks, they often need to rely on proprietary solutions that are not using current, standardized approaches. Here, it will be needed to provide the market with means to validate certain proprietary tools in terms of their predictions of Key Performance Indicators such as buffer behaviour and/or MOS predictions. To address this aspect, the Question will continue to work on the previously created work item P.ENATS (Encrypted non-intrusive assessment of TCP-based streaming), in collaboration with Q17/12.

Further work items will be addressing extensions of the P.1203 and P.1204 framework towards High Dynamic Range and Wide Color Gamut, as well as work on IP-based 360° video quality assessment.

The following major Recommendations, in force at the time of approval of this Question, fall under its responsibility:

P.1200-series

2 Question

Study items to be considered include, but are not limited to:

– What further aspects of a continued characterization of P.1201, P.1202, P.1203 and P.1204 models should be considered?
– How do P.1201, P.1202, P.1203 and P.1204 need to be maintained, and what further application guidance towards, for example, network-centric monitoring solutions needs to be provided?
– What are relevant subjective test methodologies, especially when it comes to capabilities of 4K/UHD and 8K, and respective high dynamic range, enhanced color gamut and high-framerate, and which respective new standards need to be developed (possibly in cooperation with other standardization bodies)?
– How can 4k/UHD, 8K or HDR video quality be assessed using pixel-, bitstream-based or hybrid modelling approaches?
– How can audiovisual quality be monitored for streams for these cases, and how can audio and video quality be integrated?
– How can bitstream-, signal-based and hybrid models be evaluated for these extended services in a comprehensive standardization activity on the same type of data?
– What relationship exists between the subjective responses of users at the terminals and the objective measurements made from the point at which the assessment system is connected?
– How can audiovisual synchronization be reflected in models such as P.1201, P.1202, P.1203, and P.1204?
– How can long-term integration be addressed for streaming of higher resolutions up to 4 and 8K or HDR content?
– What are the requirements on future updates of the P.1203 and P.1204 standards series for HTTP-based video quality monitoring?
– How can diagnosis assessment be done when using P.1203 and P.1204 standards?
– How can knowledge on short-term measurements and their temporal pooling for longer-term predictions be generalized to complete sessions of multimedia quality monitoring?
– How can video-quality estimation modules for conversational quality estimation models be derived from existing Q14-standards or new work within Q14?
– How can video, audiovisual quality and other effects for 360° / omnidirectional video and accompanying audio be monitored?
– How can video- and audiovisual quality prediction best benefit from different machine-learning approaches?
– How can quality of cloud gaming services be assessed?

3 Tasks

Tasks include, but are not limited to:

– maintenance of Recommendations P.1201, P.1202, P.1203 and P.1204;

- development of new Recommendation(s) on guidance for the use of P.1201, P.1202, P.1203 and P.1204 in different applications or operational contexts;
- considerations on bitstream-based audio quality evaluation;
- development of tools that are used in the course of model development;
- development of models for assessing video formats such as HDR, wide color gamut, high framerate;
- development of models for monitoring video quality in the context of conversational and conferencing services;
- development of modelling approaches for 360° / omnidirectional video streaming and accompanying audio;
- development and maintenance of a new Recommendation on non-intrusive assessment of TLS-encrypted, TCP-based multimedia streaming quality (P.ENATS).

An up-to-date status of work under this Question is contained in the SG12 work programme: http://www.itu.int/ITU-T/workprog/wp_search.aspx?q=14/12

4 Relationships

WSIS Action Lines

- C2

Sustainable Development Goals

- 9

Recommendations

- P.564, G.1000-series, J series recommendations on video quality

Questions

- 13/12, 17/12

Study Groups

- ITU-T SG13, SG16
- ITU-R WP6C

Other bodies

- 3GGP SA4, ATIS, Broadband Forum, ETSI TC STQ, HGI, IETF, MPEG, VQEG