AVHD-AS Project: Detailed Description of Test Conditions

Version 1.0

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Editorial History

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| Version | Date | Nature of the modification |
| 1.0 | Feb. 29, 2016 | Initial Draft, created by Shahid Mahmood Satti |
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1. Introduction

This document contains a detailed description of the test conditions validated in the VQEG AVHD-AS project. The conditions itself will not be presented; rather a high level parameter space is described. Any logical combination of parameters from the described space can constitute a valid test condition. The actual test design is described in a separate document.

1. Applications

As the goal of the AVHD-AS project is to validate objective methods for the assessment of adaptive bitrate streaming services like YouTube, Netflix, Hulu or Amazon Instant Video from an end users perspective, the testing conditions should be representative streaming scenarios from these video services.

In general, AVHD-AS project covers both over-the-top (OTT) and operator managed adaptive streaming as well as progressive download video services delivered through HTTP/TCP/IP, RTMP/TCP/IP, HLS/HTTP/TCP/IP, and DASH/HTTP/TCP/IP. Note that the model is agnostic to the specific network delivery method (HTTP or DASH or other), with one exception that it assumes reliable delivery (TCP/IP).

Note that user initiated state transitions are outside of the scope of this work item. More specifically pausing, seeking, user initiated quality change, user initiated play or user initiated end are all NOT considered.

1. HRC Constraints and Sequence Processing

## Sequence Processing Overview

The HRCs will be selected separately by the ILG. While audio will not used in the present tests, the audio tracks on source sequences should be retained wherever possible in both source and processed video clips (SRCs and PVSs) for use in future tests.

## Constraints on Hypothetical Reference Circuits (HRCs)

The subjective tests will be performed to investigate a range of HRCs. These HRC conditions are limited to the following:

* **Coding Distortion:** Compression artifacts (such as those introduced by varying bit-rate, codec type and so on).
* **Scaling Distortion:** The video is down-sampled and up-sampled before presentation. During the scaling aspect ratio is maintained.
* **Frame-rate Reduction:** The presented frame rate is smaller than the original frame rate.
* **Initial Buffering:** Video takes some time to load; a black frame with the loading indicator (spinning wheel) is shown at the display.
* **Re-buffering/stalling:** Video playout is interrupted by buffer depletions at the client side. Last played frame is repeatedly displayed with the loading indicator till the video starts playing again. More than one stallings of variable duration are allowed.
* **Bitrate/resolution/framerate changes (quality switching) due to the adaptivity of the player.**

**Note:**

A combination of all or a subset of above distortions in a single PVS is allowed. In a usual HTTP adaptive streaming service above distortions can occur during a single playout, naturally combinations of above distortions need to be tests. The only constraint is that quality switching should not happen more frequently than once per second.

The overall selection of the HRCs should be done such that most, but not necessarily all, of the codecs, bit rates, encoding modes and impairments set out in the following sections are represented in a single database.

### Coding Schemes

Only the following coding schemes are allowed:

* H.264/MPEG4 AVC (baseline and main profiles)
* H.265/HEVC (main profile)
* VP9 (profile 0)

Note: During a single PVS the coding scheme is constant. There are no limits on the GOP length and structure.

Note: The sum of all GOPs should be equal to the total video length

### Video Bit-Rates:

Bit rates must be chosen to accommodate the coding schemes above and to span a wide range of video quality. Following is a list of bitrate ranges to be used in combination with certain video resolutions:

* 1920x1080p: 1Mbps–15Mbps at original frame rate
* 1280x720: 700Kbps-6Mbps at original frame rate
* 854x480: 500Kbps-3Mbps at original frame rate
* 640x360: 300Kbps-1Mbps at original frame rate
* 426x240: 150Kbps-500Kbps at original frame rate (Reduced frame rate possible)
* 256x144: 100Kbps-300Kbps at original frame rate (Reduced frame rate possible)

Other scaling resolutions (maintaining the aspect ratio) are also allowed and are even recommended due to a variety of out there. In this case, the rate range from the closest resolution class can be used as reference. [Edit for non-square pixels]

### Video Encoding Modes

The encoding modes that will be used may include, but are not limited to:

* Constant-bit-rate encoding (CBR)
* Variable-bit-rate encoding (VBR)

### Frame rate

The lowest effective frame rate is 12fps. In general the PVS must have the same presented frame rate as the original SRC frame rate, i.e., in case reduced frame rate condition is employed the frame rate must be upscaled using frame repetitions to the original frame rate before presentation and feeding the sequence to the models. The maximum frame rate is 60 fps.

### Initial-Buffering and Stalling Constraints

* Each PVS must start with an initial-buffering. The initial buffering can be up-to max 30 seconds. The lower limit is 1 second.
* The lower limit on the duration of a stalling event is 1 second
* The upper limit on the duration a stalling event is 30 seconds
* Total stalling duration must not exceed 20% of the original video length
* The upper limit on number of stalling events is 6
* No stalling event is allowed in last 5 seconds of the video

## Common Test Conditions

We will include common test conditions as anchors.

## Sample Video Sequences & Test Vectors

Proponents and ILG are invited to produce sample video sequences that demonstrate the range of quality addressed by the AVHD-AS Experiments. Test vectors will be made available to all proponents. These test vectors are used to ensure compatibility between the SRC/PVS and a proponent’s model.