**3GPP TSG-SA4 Meeting #108e *S4-200665***

**e-meeting, 2 - 9 April 2020** revision of S4-200561

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.0* | | | | | | | | |
| **Pseudo CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **26.955** | **CR** | **<CR#>** | **rev** | **-** | **Current version:** | **0.0.1** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Scenario Full HD Streaming | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Incorporated, Tencent, AT&T, BBC | | | | | | | | | |
| ***Source to TSG:*** | SA4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_5GVideo | | | | |  | ***Date:*** | | | 2020-04-07 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The study item description asks for typical scenarios | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduces Full HD Streaming Scenario | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Most relevant scenario not documented | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 6.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | This pCR assumes that document S4-200559 is agreed. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**===== CHANGE =====**

# 2 References

Add at the end

[X] 2020 Mobile Internet Phenomena Report, accessible here: <https://www.sandvine.com/download-report-mobile-internet-phenomena-report-2020-sandvine>, February 2020.

[Y] 2019 Ericsson Mobility Report, accessible here: https://www.ericsson.com/4acd7e/assets/local/mobility-report/documents/2019/emr-november-2019.pdf, November 2019.

[Z] T. Fautier, "New Codecs for 5G", DASH-IF Workshop on "Media Streaming meets 5G", December 2019, accessible here: <https://dashif.org/docs/workshop-2019/04-thierry%20fautier%20-%20Harmonic%20Codec%20Comparison%205G%20Media%20Workshop_Final%20v3.pdf>

[B] Bitmovin Video Developer Report, accessible here: <https://go.bitmovin.com/video-developer-report-2019>, September 2019.

[S] Recommendation ITU-R BT.709-6 (06/2015): "Parameter values for the HDTV standards for production and international programme exchange".

[T] Recommendation ITU-R BT.2020-2 (10/2015): "Parameter values for ultra-high definition television systems for production and international programme exchange".

[V] Recommendation ITU‑R BT.2100-1 (06/2017): "Image parameter values for high dynamic range television for use in production and international programme exchange".

**===== CHANGE =====**

## 6.2 Scenario 1: Full HD Streaming

### 6.2.1 Motivation

The 2020 Mobile Internet Phenomena Report from Sandvine [X] shows that mobile video downstream traffic accounts for more than 65% of the global application category traffic share.

According to Ericsson mobility report [Y], video traffic in mobile networks is forecast to grow by around 30 percent annually through 2025 to account for three-quarters of mobile data traffic, from slightly more than 60 percent in 2019. The video traffic growth is driven by the increase of embedded video in many online applications, growth of video-on-demand (VoD) streaming services in terms of both subscribers and viewing time per subscriber, and the evolution toward higher screen resolutions on smart devices. All of these factors have been influenced by the increasing penetration of video-capable smart devices.

Furthermore, while UHD and 4K are trendy formats, the main application for mobile streaming is Full HD with 1080p at 50 or 60 frames per second is expected to be the format of choice for mobile streaming at scale. The distribution version may be downsampled to support adaptive bitrate streaming, possibly with High Dynamic Range (HDR) support. For detailed discussion please refer to the Harmonic presentation [Z].

In terms of distribution, while in the past, streaming video was delivered primarily via RTMP or RTP, fewer and fewer devices support these aging protocols each year. Instead, the latest web standards support built-in video playback and HTML5 is now by far the preferred method for video playback. And adaptive bitrate protocols dominate the distribution. According to the bitmovin developer report [B], adaptive bitrate streaming through HLS/DASH, using the CMAF/DASH based segment formats, provide vast majority for streaming video. The distribution is used for On-Demand and Live Streaming.

### 6.2.2 Description of the Anticipated Application

In the context of 3GPP services, 5G Media Streaming [9] as well as the TV Video Profiles [3] are specifications addressing this streaming scenario. Both, 5G Media Streaming [9] and TV Video Profiles [3] builds on CMAF-based Segment formats and DASH distribution. From TS 26.116, the following operation points may be considered in scope of the Full HD Streaming Scenario (pending availability of appropriate test content):

- H.265/HEVC Full HD HDR, see TS26.116 [3] clause 4.5.3.

- H.264/AVC Full HD, see TS26.116 [3] clause 4.4.3.

- H.265/HEVC Full HD, see TS26.116 [3] clause 4.5.5.

- H.265/HEVC Full HD HLG, see TS26.116 [3] clause 4.5.7.

These operation points are further informed by relevant operational experience with commercially available encoders and decoders.

The considered scenario is the distribution of content through DASH/CMAF based streaming. Important aspects that are expected to be considered when evaluating a codec in the context of this:

- Quality and Coding Efficiency:

- High and uninterrupted visual quality, taking into account the service constraints.

- Any savings can provide significant benefits due to the expected large volume of the traffic either in quality or network utilization.

- Adaptive Bitrate streaming:

- Multiple bit rates are provided, typically with a ladder of 30–50% to permit bandwidth adaptation. The use of constant bit rate (CBR) encoding maximises reuse of a common ladder of encoded representations across multiple distribution networks. The use of capped variable bit rate (VBR) encoding allows the bit rate to be varied according to the difficulty of the source material while maintaining the ability to distribute the encoded representations through distribution networks with fixed capacity. This also maximises reuse of a common ladder across multiple distribution networks.

- CMAF Fragments of size typically in the range of 1–6s to permit seamless switching for bit rate adaptation.

- Regular Random Access, typically every 1–2 seconds according to TS 26.116 [3]. To achieve clean switching in both sound and picture when moving between different encoded representations in the ladder, 3.84 seconds enables video segment boundaries to be aligned with an integer number of audio Access Units.

- Encoding in this scenario is typically done as

- Live and On-Demand distribution and encoding

- Server and Cloud-based Encoding

- No specific encoding latency constraints

### 6.2.3 Source Format Properties

Table 6.2-1 provides an overview of the different source signal properties following the information from TS26.116 [3]. This information is used to select proper test sequences.

Table 6.2-1 Source Format Properties for different operation point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Source Format Properties | H.264/AVC Full HD | H.265/HEVC Full HD | H.265/HEVC Full HD HDR | H.265/HEVC Full HD HLG |
| Spatial resolutions | 1920 × 1080 (Distribution: 1920 × 1080, 1600 × 900, 1280 × 720, 960 × 540, 854 × 480, 640 × 360,426 × 240) | | | |
| Chroma Format | Y'CbCr | | | |
| Chroma Subsampling | 4:2:0 | | | |
| Picture Aspect ratios | 16:9 | | | |
| Frame rates | 24; 25; 30; 50; 60; 24/1.001; 30/1.001; 60/1.001 Hz | | | |
| Bit Depth | 8 | 8, 10 | 10 | 10 |
| Colour space formats | BT.709 [S] | BT.709 [S]; BT.2020 [T] | BT.2020 [T] | BT.2020 [T] |
| Transfer Characteristics | BT.709 [S] | BT.709 [S]; BT.2020 [T] | BT.2100 [V] PQ | BT.2100 [V] HLG |

### 6.2.4 Encoding and Decoding Constraints

Table 6.2-2 provides an overview of encoding and decoding constraints for H.264/AVC Full HD and H.265/HEVC Full HD Profiles. This will support the definition of detailed test conditions.

Table 6.2-2 Encoding and Decoding Configurations

|  |  |  |
| --- | --- | --- |
| Encoding and Decoding Constraints | H.264/AVC Full HD | H.265/HEVC Full HD |
| Relevant Codec and Codec Profile/Levels according to TS26.116 and TS26.511. | H.264/AVC Progressive High Profile Level 4.2 [7] | HEVC/H.265 Main-10 Profile  Main Tier Level 4.1 [8] |
| Random access frequency | 1 second, 3.84 seconds [other numbers tbd] | 1 second, 3.84 seconds [other numbers tbd] |
| Error resiliency requirements | None | None |
| Bit rates and quality configuration | QP = [20, 23, 26, 29]  others | QP = [23[[1]](#footnote-1), 25, 28, 31, 34]  others |
| Bit rate parameters (CBR, VBR, CAE, HRD parameters) | Fixed QP  CBR 8–12 Mbit/s  VBR capped at 12 Mbit/s  others | Fixed QP  CBR 5–8 Mbit/s  VBR capped at 12 Mbit/s  others |
| ABR encoding requirements (switching frequency, etc.) | 1 second [other numbers tbd]  ABR through multiple QPs | 1 second [other numbers tbd]  ABR through multiple QPs |
| Latency requirements and specific encoding settings | No latency requirements beyond RAP so picture reordering allowed | No latency requirements beyond RAP so picture reordering allowed |
| Encoding complexity context | real-time encoding, cloud-based encoding, offline encoding, etc.  detailed parameters tbd | real-time encoding, cloud-based encoding, offline encoding, etc.  detailed parameters tbd |
| Required decoding capabilities | H.264/AVC Progressive High Profile Level 4.2 [7] | HEVC/H.265 Main-10 Profile  Main Tier Level 4.1 [8] |

### 6.2.5 Performance Metrics

tbd

### 6.2.6 Interoperability Considerations

tbd

### 6.2.7 Test Sequences

#### 6.2.7.1 Standard Dynamic Range

Example sequences arer here https://media.xiph.org/video/derf/

#### 6.2.7.2 High Dynamic Range

tbd

### 6.2.8 Detailed Test Conditions

#### 6.2.8.1 Overview

tbd

#### 6.2.8.2 Reference Software AVC 1

tbd

#### 6.2.8.3 Reference Software HEVC 1: HM16.20

As reference software for HEVC, the following was used

- <https://hevc.hhi.fraunhofer.de/svn/svn_HEVCSoftware/tags/HM-16.20/>

Example setting: <https://hevc.hhi.fraunhofer.de/svn/svn_HEVCSoftware/tags/HM-16.20/cfg/encoder_randomaccess_main10.cfg> with following proposed changes

- IntraPeriod: Intra Period such that 1 second is achieved

- DecodingRefreshType: 1 (CRA) 🡺 2 (IDR)

- GOPSize: adjusted to Intra

- QP: [25, 28, 31, 34]

### 6.2.9 External Performance Data

tbd

### 6.2.10 Additional Information

tbd

1. Achieves the objective of high quality for more difficult source material. [↑](#footnote-ref-1)