**Source: Qualcomm Incorporated**

**Title: 5GMS3: Video Codec Support**

**Agenda Item: 8.7**

# **1. Introduction**

In TS 26.511, v1.2.0 (available in S4-200510), two options are provided for the support of video codecs for downlink streaming 5GMS profiles in clause 5.2.2. The difference of the two options are as follows:

* Option A:

AVC-HD-Dec decoding capability shall be supported as defined in clause 4.2.1.1.

HEVC-HD-Dec decoding capability should be supported as defined in clause 4.2.2.1

* Option B:

AVC-FullHD-Dec decoding capability shall be supported as defined in clause 4.2.1.1.

HEVC-FullHD-Dec decoding capability shall be supported as defined in clause 4.2.2.1

This was discussed in #107 meeting in S4-200225 and 14 companies co-signed support for option B. The decision was postponed and was considered to only be addressed in a f2f meeting. The proponents did not consider submitting any new information for SA4#108-e due to the circumstances of an e-meeting.

However, at this meeting document S4-200522 was submitted and supported by 2 companies providing new interesting data and background on certain deployments for 5G Media Streaming.

This new information is used for a more elaborated draft proposal to address the facts and concerns from both S4-200225 and S4-200-522.

# **2. Summary of some key facts from S4-200225 and S4-200522**

From S4-200225:

* As of 2019, HEVC is supported in all mobile chipsets in hardware. A not even very recent study from 2018 provides an overview: <https://www.scientiamobile.com/growing-support-of-hevc-or-h-265-video-on-mobile-devices/>. In the 2018 Q2 Mobile Overview Report (MOVR), the growing support for hardware-accelerated HEVC decoding among mobile devices was analyzed. 78% of iPhone and 57% of Android smartphone requests come from devices that support hardware-accelerated HEVC decoding. According to this study, furthermore, level 4.1 support is available on all HEVC supporting iOS devices and 50% of the Android devices. Generally, HEVC is also adopted for FullHD streaming services in other domains. As of today, more than 2 Billion HEVC supported devices are on the market1.
* HEVC is also broadly supported by the content industry in terms of encoding. All encoder vendors support HEVC, and HEVC is broadly supported across open source encoders such as FFMPEG with x265.
* Furthermore, it is important to understand that a multi-codec world with restricted support of codecs represents a significant cost increase1. Providing confidence to content and service providers with the availability of a single good codec for HD streaming will reduce delivery, storage and content generation costs.

From S4-200522:

* HEVC supported mobile devices are 78% of iPhone and 57% of Android smartphone given in 2018 Q2 Mobile Overview Report (MOVR), however this ratio will be significantly reduced for low-end (<$200) mobile terminals. Low-end mobile devices will play an important role in 5G large-scale promotion. Take the African market as an example[[1]](#footnote-2), IDC data report shows that sales share of low-end among 200 million+ mobile sold in 2019 accounts for more than 85%. As of today, 5G cell phones with price of $300 have achieved good sales, and in 2021-2022 more low-end 5G products will enter the market. Due to the price sensitivity, the screen of 720p will still be their main choice. HEVC-FullHD decoding capability may improve the unnecessary cost for these kinds of terminals.
* On the age of 4G, smart phone is nearly synonym the mobile terminal. Yet for the coming 5G age, the terminal species will grow explosively. Wearable devices, VR all-in-one headsets, kinds of 5G IoT devices are changing our lives styles. The resolution of Apple watch series 5 is 368×448, 360p media streaming will be considered high quality by users, 5GNW+AVC codec is simple and efficient enough. The requirements on video codec related to the immersive use cases[[2]](#footnote-3) (i.e., FoV, free viewport, VR), as the acknowledged killer applications of 5G, should be greatly considered when making a choice on the current video codecs in 5G. The bit budget for streaming 4K60p with HEVC is 15-25 Mbit/s and 8K60p with HEVC is up to 40Mbit/s brings burden to 5GNW at scale, besides for some formats like Point Cloud, HEVC is not fully suitable. Mandatory HEVC decoder seems not flexible and powerful enough for explosive kinds of terminals.
* Single-codec world is truly an ideal situation. But the candidate needs relative competitive technical advantages, industry status, reasonable and clear licensing model. AVC takes the thunder more than 10 years and still dominates in popular streaming services even 7 years after HEVC providing a typically 50% bitrate reduction. From the view of today and the future 2-3 years, HEVC is facing the challenge of too many competitive technologies with their own characteristics (including AVC, EVC, VVC). At the same time, the application requirements are rapidly diversifying. Multi-codec world already exists.

# **3. Fact Overview**

From the summary in clause 2, it is obvious that there are three main cases:

1. Streaming in the 5G context can be differentiated into mainstream high-end devices to smart phones with FullHD, 60p and typically some HDR support.
2. Streaming to lower-end devices and possibly IoT devices with screens of 720p and lower (all the way to only 360p)
3. New verticals and formats such as VR, 8K, etc.

Whereas document S4-200225 viewed the default profile for 5G media streaming as defined in TS26.511 mostly in the context of 1), the document in S4-200522 discusses additional use cases and verticals in 2 and 3, or even beyond.

5G Media Streaming in the first Release clearly addresses use case 1). Based on the important discussion from S4-200522, also the use cases and scenarios in the context of 2) should be considered, similar as done for MTSI. In MTSI, the constrained terminal was introduced:

**Constrained terminal:** UE that is (i) operating in radio access capability category series "M" capable of supporting conversational services, and/or (ii) a wearable device which is constrained in size, weight or power consumption (e.g. connected watches), excluding smartphones and feature phones.

Note that TS26.114, clause 5.2.2 states

MTSI clients in terminals offering video communication shall support:

- H.264 (AVC) [24] Constrained Baseline Profile (CBP) Level 1.2;

- H.265 (HEVC) [119] Main Profile, Main Tier, Level 3.1. The only exception to this requirement is for the MTSI client in constrained terminal offering video communication, in which case the MTSI client in constrained terminal should support H.265 (HEVC) Main Profile, Main Tier, Level 3.1.

In addition, they should support:

- H.264 (AVC) [24] Constrained High Profile (CHP) Level 3.1.

Also considered in S4-200522, that for longer time-frames (Rel-17 and beyond), it is important to investigate new codecs and verticals. The FS\_5GVideo SID including to characterize existing 3GPP video codecs (AVC, HEVC) and to collect initial information on potential future video codecs (EVC, VVC) is addressing this, but this is outside of the scope of 5GMS3.

# **4. Definition of Terminal Classes**

As rightly identified in S4-200522, media in the context of 5G Streaming will hit multiple device types. Based on this and the experience from MTSI, it is proposed to introduce multiple device classes in 5G Media Streaming. As an example, the following device classes may be initially considered:

1. Constrained Terminal: UE that is (i) operating in radio access capability category series "M" capable of supporting conversational services, and/or (ii) a wearable device which is constrained in size, weight or power consumption (e.g. connected watches), excluding smartphones and feature phones (iii) screen resolution is smaller than 720p
2. Baseline Terminal: UE that is (i) operating in radio access capability category series tbd, and/or (ii) a phone which is constrained in size, weight or power including smartphones and feature phones (iii) screen resolution is smaller than 1080p
3. Main Terminal: UE that is (i) operating in radio access capability category series tbd, and/or (ii) a typical smart phone (iii) screen resolution is at least 1080p (iv) typically includes HDR capabilities
4. High Terminal: UE that is (i) operating in radio access capability category series tbd, and/or (ii) typically a TV Set or a high-end tablet/phone (iii) screen resolution is at least 4K (iv) includes HDR capabilities
5. VR HMD: UE that is (i) operating in radio access capability category series tbd, and/or (ii) an Head-Mounted display (iii) screen resolution is at least 4K

More details may be added to categorize the classes better.

# **5. Proposal**

Based on the discussion in this document, the following is proposed:

1. Introduce terminal classes in TS 26.511, at for the timing at least 2 terminal classes
	1. Baseline Terminal, following the guidelines in clause 4
	2. Main Terminal, following the guidelines in clause 4

NOTE: other classes may be defined based on the TV Video Profiles and the VR Profiles, but are not subject of this discussion

1. Apply the following requirements for Rel-16 terminals in the classes:
	1. Baseline Terminal:
		1. AVC-HD-Dec shall be supported
		2. HEVC-HD-Dec should be supported
	2. Main Terminal
		1. AVC-FullHD-Dec shall be supported
		2. HEVC-FullHD-Dec shall be supported
2. Create a draft CR on this matter for a 5GMS3 telco
3. Postpone the final decision on this matter to SA4#109-e (or later)
1. <https://www.idc.com/getdoc.jsp?containerId=prMETA45682319> [↑](#footnote-ref-2)
2. <https://newzoo.com/insights/articles/the-new-reality-for-mobile-gaming-the-vr-ar-opportunity/> [↑](#footnote-ref-3)