**3GPP TSG-S4 Meeting # 130**

Orlando (FL-US), 18-22 November 2024 revision of S4-241760

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **804** | **CR** | 11 | **rev** | **6** | **Current version:** | 18.1.0 |  |
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| *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)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Title:*** | FS\_AMD: WT9: DASH/HLS Interoperability general description | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Tencent | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_AMD | | | | |  | ***Date:*** | | | 24-11-22 |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | Adding a general description and the use cases that CTA-5005 addresses, and simple deployment scenarios. | | | | | | | | |
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| ***Summary of change:*** | | WT9.1:  - Introduction and general description  - overview of CTA-5005A  - additional use cases to CTA-5005A  - various aspcets of the study  WT9..2:  - Two collaboration scenarios. | | | | | | | | |
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| ***Consequences if not approved:*** | | Lack of progress | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2; 5.21 (new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | |  | **X** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| **1st Change** |

## 2 References

[MPEG-DASH] ISO/IEC 23009-1 Information technology — Dynamic adaptive streaming over HTTP (DASH) Part 1: Media presentation description and segment formats

[HLS] IETF RFC8216: "HTTP Live Streaming",  
<https://www.rfc-editor.org/rfc/rfc8216.txt>

[CMAF] ISO/IEC 23000-19: "Information technology — Multimedia application format (MPEG-A) 19: Common media application format (CMAF) for segmented media".

[DASHIF-INGEST] DASH Industry Forum: "DASH-IF Live Media Ingest Protocol v1.2", February 2024,  
<https://dashif-documents.azurewebsites.net/Ingest/master/DASH-IF-Ingest.pdf>

[CTA-5005A] Consumer Technology Association CTA-5005-A: "Web Application Video Ecosystem – DASH-HLS Interoperability Specification",  
<https://shop.cta.tech/products/web-application-video-ecosystem-dash-hls-interoperability-specification-cta-5005-a> [CTA-5004] CTA-5004 Web Application Video Ecosystem -Common Media Client Data, <https://cdn.cta.tech/cta/media/media/resources/standards/pdfs/cta-5004-final.pdf>

[MPEG-CE] ISO/IEC 23001-7: "Information technology — MPEG systems technologies Part 7: Common encryption in ISO base media file format files".

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| **2nd Change** |

## 5.21 DASH/HLS interoperability

### 5.21.1 Description

In Release 18, TS 26.501 [15] and TS 26.510 [26510] added support for media delivery in multiple formats. A downlink media streaming service may be provisioned to support multiple ingest and distribution formats. Among popular streaming formats are MPEG DASH [MPEG-DASH] and HLS [HLS]. Both of these delivery formats allow the use of a common media format known as CMAF [CMAF] for distribution.

Furthermore, the DASH-IF Live Ingest specification [DASHIF-INGEST] enables streaming of the content to an ingest point using CMAF with an additional DASH MPD or HLS m3u8 manifest. TS 26.501 [15] and TS 26.512 [16] also specify the optional use of this protocol for uplink media contribution and egest.

DASH/HLS interoperability is a key issue in supporting highly scalable distribution systems for CDN-based distribution as well as for MBS/MBMS distribution. Offering common CMAF segments that can be consumed by both DASH and HLS media players promises to address these issues.

The CTA WAVE DASH-HLS Interoperability Specification [CTA5005A] specifies how to generate CMAF content that can be delivered using both a DASH MPD and an HLS m3u8 manifest. These guidelines cover the following use cases:

1. *Basic on-demand and live streaming:* The CMAF content is provided without encryption for on-demand or live consumption.

2. *Low-latency live streaming:* The CMAF content is provided to be consumed in a low-latency fashion with an end-to-end delay less than 3 times that of the CMAF segment duration.

3. *Encrypted media content:* The content of case 1, but MPEG Common Encryption [MPEG-CE] is applied.

4. *Presentation splicing:* The content is similar to case 1, but consists of multiple CMAF presentations, either concatenated or spliced in the middle from one to another.

5. *Carriage of timed event data:* Timed metadata is delivered with the CMAF content, either as part of the media segments, or as part of the presentation manifest, and is expected to be delivered and processed along the media timeline.

6. *Carriage of track roles:* Content is annotated with the role of each track/switching set and these annotations need to be delivered to the client to be used for the selection process.

In addition to the above, the following additional use cases are considered in this Key Issue:

7. *Content steering:* When the content is deployed using the two-manifest formats, content steering is expected to work seamlessly for both, optimising the delivery of CMAF media segments to any client using any of the manifest formats, using the same content steering server (see clause 5.17).

8. *Server guided content insertion:* The same content (e.g. commercial advertisements) encoded in CMAF is expected to be inserted by clients during the playback of on-demand or live content including pre-roll and mid-roll advertising breaks and early termination scenarios.

In this Key Issue, the following questions are studied:

a) Whether the existing codec profiles for 5G Media Streaming in TS 26.511 [96] satisfy the conditions defined by CTA-WAVE in [CTA-5005A], or if any additional constraints must to be added to leverage the same CMAF content for the above use cases.

b) In deployments of the above use cases, whether various 3GPP-defined service descriptions can be realised in the two formats with the same quality or whether there are any limitations in the various deployment scenarios.

c) In deployments of the above use cases, whether the reporting mechanism in 3GPP works on par for both formats, including the use of the CMCD [CTA-CMCD] (see clause5.16).

### 5.21.2 Collaboration scenarios

#### 5.21.2.1 Collaboration Scenario 1: CMAF content and both DASH and HLS manifest provided by the 5GMSd Application Provider

In this collaboration scenario, DASH and HLS presentation manifests for the same content are generated by the 5GMSd Application Provider and are delivered to the 5GMSd AS. The CMAF media segments are common between the two manifests and are either pushed to the 5GMSd AS promptly by the 5GMSd Application Provider, or pulled bythe 5GMSd AS from the 5GMSd Application Provider on first request from a 5GMSd Client.

#### 5.21.2.2 Collaboration Scenario 2: CMAF content and one manifest format provided by the 5GMSd Application Provider

In this collaboration scenario, the CMAF content and either a DASH MPD or an HLS m3u8 presentation manifest is provided by the 5GMSd Application Provider to the 5GMSd AS. The content is either pushed to the 5GMSd AS promptly by the 5GMSd Application Provider or pulled by the 5MGSd AS from the 5GMSd Application Provider on first request from a 5GMSd Client. The content preparation function of the 5GMSd AS generates the other manifest format upon receiving the provided manifest format.

### 5.21.3 Architecture mapping

The architecture leverages CMAF as a foundational element, enabling compatibility across both DASH and HLS delivery formats as specified in [MPEG-DASH] and [HLS]. It is expected to incorporate the DASH-IF Live Media Ingest Protocol [DASHIF-INGEST], facilitating seamless content preparation and delivery using unified CMAF segments. This is meant to ensure scalable and efficient distribution across CDN-based systems.

Further study is necessary to validate the integration of these elements.

### 5.21.4 High-level call flow

A proposed call flow may begin with the generation of CMAF segments accompanied by either DASH MPD or HLS manifests as defined by [CTA-5005A]. In collaboration scenarios, these manifests are either provided directly by the 5GMSd Application Provider or generated dynamically by the 5GMSd AS.

Further study is needed to address synchronization between manifests and integration of timed metadata to maintain seamless client playback.

### 5.21.5 Gap analysis and requirements

Identified gaps include ensuring codec compatibility with CTA-WAVE guidelines, optimizing manifest synchronization for low-latency streaming, and addressing disparities in reporting mechanisms such as CMCD [CTA-CMCD]. Further analysis is needed to determine the scalability of these solutions in varying network conditions.

### 5.21.6 Candidate solutions

Candidate solutions include standardizing CMAF segment creation to support dual manifest outputs and enhancing the DASH and HLS ingest protocols [DASHIF-INGEST]. The integration of server-side content steering, as described in Clause 5.17, is for further study.

### 5.21.7 Summary and conclusions

With CMAF as a common format, the framework complies with both DASH and HLS, ensuring interoperability and scalability. The guidelines from [CTA-5005A], complemented by MPEG encryption standards [MPEG-CE] and ingest protocols [DASHIF-INGEST], provide a solid foundation. However, further study is needed to validate the performance in hybrid deployment scenarios.