**3GPP TSG SA WG4 Meeting 133-e** ***S4-251370***

**online, , 18 – 25 Jul 2025**

**Agenda item:** 8.5

**Source:** Qualcomm Incorporated

**Title:** [AMD\_PRO-MED] Support for multiple Service Locations in DASH

**Document for** Discussion and Agreement

# Introduction

During SA4#131 Work Item on “Stage 3 for Advanced Media Delivery” was agreed in [S4-250411](https://www.3gpp.org/ftp/tsg_sa/WG4_CODEC/TSGS4_131_Geneva/Docs/S4-250411.zip) and afterwards approved in by SA plenary #107 in [SP-250265](https://www.3gpp.org/ftp/tsg_sa/TSG_SA/TSGS_107_Incheon_2025-03/Docs/SP-250265.zip).

The objective of this work item is to address the recommendations for stage-3 extensions of the studies FS\_AMD and FS\_MS\_NS\_Ph2 in the relevant specifications, primarily TS 26.510, TS 26.512 and TS 26.517, and based on the stage-2 extensions in TS 26.501 and TS 26.502.

# Summary of TR 26.804

In [TR 26.804](https://www.3gpp.org/ftp/Specs/archive/26_series/26.804/26804-j01.zip), the analysis in clause 5.19.7 provides the following summary:

This Key Issue has considered the integration of different technologies into the 5G Media Streaming System that allow downlink media streaming applications to efficiently access content located across multiple content sources/endpoints. These technologies include:

- DNS-based switching,

- MPEG-DASH client-side switching,

- Content steering driven switching,

- SAND4M multi-source/endpoint delivery (to a limited extent), and

- CMMF-based multi-source/endpoint delivery.

In almost all cases, these technologies may be employed over-the-top of the 5GMS System using methods outside the scope of 5GMS (with the exception that the 5GMS Client is underspecified regarding multi-source/endpoint operation). However, explicit support for multi-source/endpoint media delivery throughout the 5GMS System is recommended through the following changes to 5GMS specifications:

1. Document additional collaboration scenarios for multi-source media streaming, including associated call flows for both over-the-top multi-source delivery and 5GMS-integrated multi-source delivery, in annex A of TS 26.501 [15].

2. *Candidate Solution 1a (clause 5.19.6.2.1.2) and Candidate Solution 1b (clause 5.19.6.2.1.3).* Specification of Content Preparation Templates are outside the scope of 3GPP. These Content Preparation Templates may be used for the following purposes:

a. Repackaging ingested content (e.g., repackage content from MPEG-DASH to CMAF).

b. Embellishing, or otherwise modifying, the Media Entry Point resource (e.g., MPEG-DASH MPD) ingested at reference point M2d before distributing it at reference point M4d to include references to content service locations/endpoints (e.g., *BaseURL* elements), content steering service endpoints (e.g., *ContentSteering* URL), etc.

c. Encoding content ingested at reference point M2d into multiple CMMF representations/stripes before distributing it at reference point M4d (e.g., CMMF delivery).

Content Preparation Templates may be specified through:

- A multipurpose document format such as MPEG-I Part 8 (Network-Based Media Processing) as specified in ISO/IEC 23090-8 [130]), or

- A document format bespoke to the form of content preparation (e.g., a CMMF configuration file format specified in an annex to ETSI TS 103 973 [126]).

The generic MIME content type of each Content Preparation Template format is listed in clause 4.3.5.2 of TS 26.512 [16] as valid for use with the 5GMS System, along with references to the set of valid profiles specified in TS 26.511 [96] and relevant external specifications.

3. Verification of Content Preparation Template signalling and implementation within 5GMS specifications is correct.

4. *Candidate Solution 2a (clause 5.19.6.2.2.2.1).* At the discretion of the 5GMSd AF, content preparation may be centralized or distributed among multiple 5GMSd AS Content Distributions defined within a single Content Hosting Configuration. Content prepared in one 5GMSd AS Content Distribution may be conveyed to another 5GMSd AS Content Distribution via reference point M10d on a hierarchical or peer-to-peer basis at the discretion of the 5GMSd AF. Clause 5.2.8 in TS 26.510 [108] is updated appropriately.

To support this, the 5GMS architecture defined in clause 4.1 of TS 26.501 [15] and the reference point definitions are amended to bring reference point M10 into scope.

5. *Candidate Solution 3c (clause 5.19.6.2.2.3.3).* Provide the option in clauses 5.2.8 and 8.8.3 of TS 26.510 [108] for the 5GMSd Application Provider to influence how Content Distributions are provisioned across multiple 5GMSd AS instances.

*Candidate Solution 3c* provides the 5GMSd Application Provider the ability to define distribution affinity groups which may be used by the 5GMSd AF when provisioning the Content Hosting Configuration across a set of 5GMSd AS instances. This candidate solution not only supports the intent of Candidate Solutions 3a (clause 5.19.6.2.2.3.1) and 3b (clause 5.19.6.2.2.3.2), but it also provides greater flexibility in how Content Distributions are provisioned within the 5GMSd AS.

6. *Candidate Solution 4a (clause 5.19.6.3.2).* Where applicable, document within 5GMS specifications the ability to signal the capability to deliver media from multiple content sources/endpoints using information contained within the Media Entry Point resource. This includes updating clauses within both TS 26.501 [15] and TS 26.512 [16]. Since signalling relevant information is performed outside the scope of 3GPP, 5GMS specification updates should be limited to providing clarity that this option exists.

7. A "5GMS Media Player" is defined within TS 26.501 [15] where appropriate requirements, functions, APIs, etc. are specified for the purposes of Media Player interoperability within the 5GMS System.

8. *Candidate Solutions 5a (clause 5.19.6.5.2.1).* The Media Player as defined in clause 4.2.2 of TS 26.501 [15] and clause 13.2 of TS 26.512 [16] natively supports the multi-source/endpoint media delivery approach (e.g., MPEG-DASH client-side switching, CMMF-enabled delivery, etc.) in use. However, its design is considered outside the scope of the 5GMS architecture. Both clauses should be updated to explicitly state that the Media Player natively supports the multi-source/endpoint delivery approaches considered within this Key Issue when the approach(es) are used to deliver media.

9. *Candidate Solution 6a (clause 5.19.6.5.4.1)*. Changes to the existing Media Session Handling (M6d) or Media Stream Handler (M7d/M11d) APIs are not recommended at this time since the preferred solution is that multiple source/service location information required by the Media Player are communicated within a Media Entry Point document.

10. *Candidate Solution 7*. A new reference point between the Media Player and a non-5GMS content hosting function, currently labelled mExternal in clause 5.19.3.1.1, is added to the 5GMS architecture defined in clause 4 of TS 26.501 [15] for user plane information exchange. This may also include the definition of a new Media Player function referenced as the "External Access Client" in clause 5.19.3.1. The operation of this function is considered outside the scope of the 5GMS System.

This clause primarily addresses the yellow issues in the context of DASH.

# Text Proposal

# 2 References

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

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# G.4 DASH distribution using multiple service locations

## G.4.1 Overview

This clause defines the requirements and recommendations to support multiple service locations in DASH-based 5G Media Streaming according to clause 5.2.6 of TS 26.501 [2].

## G.4.2 Content Preparation Template requirements to support multiple service locations

Assuming that:

1. Content conforming to TS 26.511 [35], or at least conforming to CMAF according to ISO/IEC 23000‑19 [40], is made available to the 5GMSd AS via reference point M2d:

2. Multiple service locations have been provisioned at reference point M1d as distinct distribution configurations using the Content Hosting Provisioning (M1) API specified in clause 7.6 and following the Content Hosting provisioning (M1) procedures specified in clause 4.3.3,

3. The Media Entry Point (e.g., MPD) describing the Media Presentation shall indicate the following parameters for each service location:

a) (Required) A base URL configuring a distribution on the 5GMSd AS

b) (Required) A service location that fulfils the requirements for a service location as specified in ISO/IEC 23009-1 [32].

c) (Optional) An availability time offset that adjusts the Segment availability time for this service location.

d) (Optional) An indication of whether all Segments of all associated Representation are complete at the adjusted availability start time.

e) (Optional) A timeshift buffer depth indicating, for a DASH Media Presentation of type dynamic, the duration of the smallest timeshift buffer for which Segments of any Representation are guaranteed to remain available.

f) (Optional)An indication of whether or not partially available Segments may be accessed with an HTTP byte range request. If a Media Player makes a byte-range request against a partially available Segment, and the first-byte position of that range request is non-zero, and the Media Player desires a continuously aggregating/live response, then it should signal this using the convention of RFC 8673 [61]. Specifically, it should use a last-byte value of 9007199254740991. The 5GMSd AS shall respond with an HTTP 206 (Partial Content) aggregating response instead of responding with a 200 (OK) response and a Content-Length response header after waiting for the end of the Segment to become available. If the parameter indicates that partially available Segments may not be accessed with an HTTP byte range request, the Media Player should not expect a response corresponding to the requested byte range.

The following parameters shall be made available to the 5GMSd AS in the Content Preparation Template:

1. A mapping of each CMAF track to one or multiple service locations.

## G.4.2 DASH content offering requirements and recommendations

A DASH Media Presentation offering multiple service locations shall provide a service offering that conforms to a DASH Media Profile for CMAF content as defined in ISO/IEC 23009-1 [32], with the following additional requirements:

1. For each Representation that represents a CMAF track, all BaseURL elements shall be associated with this Representation whereby the value of the element is the base URL provided in the template and the @serviceLocation attribute shall be set to the distributionBaseURL of the corresponding service location provisioned in a Distribution Configuration of the Content Hosting Configuration.

2. For each base URL, the associated parameters may be set as well, and be mapped to the BaseURL element.

3. The resources shall be made available by the 5GMSd AS at reference point M4d according to the configuration for each base URL.

## G.4.3 Media Player requirements and recommendations

A Media Player supporting multiple service locations shall request content from an alternative base URL declared in the MPD (using a BaseURL element) if the endpoint of one service location fails.

## G.4.5 Examples

For examples, to be added.

# G.5 Content steering

Editor’s Note: similar preparation, logic for sending steering message up to 5GMS AS, may use CMCD to collect information. Client shall support ETSI TS 103 799.

# Proposal

It is proposed that

1. Add DASH-based multiple service locations and Content Steering to TS 26.512
2. Use this text as baseline and integrate into existing CRs or create new onew