**3GPP TSG- Meeting # *r01***

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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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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | **Media delivery from multiple service endpoints/locations:** Content distributors often use multiple Content Delivery Networks (CDNs) to distribute their content to end-users. As an example, they may upload a copy of their catalogue to each CDN, or more commonly have all CDNs pull the content from a common origin. In advanced deployments, technologies such as Coded Multisource Media Format (CMMF) use Application Layer FEC techniques to stripe different subsets of content across multiple CDNs. Different client implementations may then beneficially use the content on multiple CDNs, potentially guided by the service or network provider. Integration of these different technologies into the Media Delivery System is of relevance to address content provisioning, content hosting, impacts on reference points, as well as potential benefits in terms of quality and resource usage. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | *Media delivery from multiple service endpoints/locations* as introduced in clause 5.19 and based on the conclusions in clause 6.19 of TR 26.804:  i. Document the generic MIME content types and references to valid profiles or relevant external specifications for Content Preparation Templates used for the purposes of multi-source/service location content preparation (item 2 of clause 5.19.7 of TR 26.804).  ii. Extend the ContentHostingConfiguration resource to allow Content Distributions to be declared in hierarchical or peer-to-peer configurations (item 4 of clause 5.19.7 of TR 26.804).  iii. Extend the ContentHostingConfiguration resource to allow the 5GMSd Application Provider the capability to influence the configuration and deployment of Content Distributions with the 5GMSd AS at the time of provisioning (item 5 of clause 5.19.7 of TR 26.804).  iv. Clarify the use of the Media Entry Point for the purposes of communicating service location and multi-source/service location configuration information to 5GMSd Clients (item 6 of clause 5.19.7 of TR 26.804).  v. Clarify the expectation that the Media Player natively supports the multi-source/service location approach in use (item 8 of clause 5.19.7 of TR 26.804)  vi. Introduce CMMF in TS 26.511 as a format for delivering media from multiple service locations including possible definition of CMMF profiles for use in 5GMS.  vii. Introduce Content Steering as an M4 API in TS 26.512 and for use with 3GP-DASH (TS 26.247 [26]).  viii. Support other relevant aspects resulting from stage-2. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Features not supported. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 26.510 CR 0016, TS 26.511 CR 0014, TS 26.247 CR 0190 | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
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| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

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# 2 References

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[67] ETSI TS 103 998: “Publicly Available Specification (PAS); DASH-IF: Content Steering for DASH”, January 2024.

[68] ETSI TS 103 973: “Coded Multisource Media Format (CMMF) for Content Distribution and Delivery”, October 2024.

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## 3.3 Abbreviations

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CMMF Coded Multisource Media Format

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## 4.2 APIs relevant to downlink media streaming

Table 4.2‑1 summarises the APIs used to provision and use the various downlink media streaming features specified in TS 26.501 [2].

Table 4.2‑1: Summary of APIs relevant to downlink media streaming features

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 5GMSd feature | Abstract | Relevant APIs | | |
| Interface | API name | Clause |
| Content protocols discovery | Used by the 5GMSd Application Provider to interrogate which content ingest protocols are supported by 5GMSd AS(s). | M1d | Content Protocols Discovery API | 7.5 |
| Content hosting | Content is ingested, hosted and distributed by the 5GMSd AS according to a Content Hosting Configuration associated with a Provisioning Session. | M1d | Provisioning Sessions API | 7.2 |
| Server Certificates Provisioning API | 7.3 |
| Content Preparation Templates Provisioning API | 7.4 |
| Content Hosting Provisioning API | 7.6 |
| M2d | HTTP pull-based content ingest protocol | 8.2 |
| DASH-IF push-based content ingest protocol | 8.3 |
| M3d | Server Certificates configuration API | 9.2 |
| Content Preparation Templates configuration API | 9.3 |
| Content Hosting configuration API | 9.4 |
| M4d | MPEG‑DASH [4] or 3GP‑DASH [37] or DASH-IF push-based content distribution | 10 |
| M5d | Service Access Information API | 11.2 |
| M10d | HTTP pull-based content ingest protocol | 8.2 |
| DASH-IF push-based content ingest protocol | 8.3 |
| Metrics reporting | The 5GMSd Client uploads metrics reports to the 5GMSd AF according to a provisioned Metrics Reporting Configuration it obtains from the Service Access Information for its Provisioning Session. | M1d | Provisioning Sessions API | 7.2 |
| Metrics Reporting Provisioning API | 7.8 |
| M5d | Service Access Information API | 11.2 |
| Metrics Reporting API | 11.4 |
| Consumption reporting | The 5GMSd Client provides feedback reports on currently consumed content according to a provisioned Consumption Reporting Configuration it obtains from the Service Access Information for its Provisioning Session. | M1d | Provisioning Sessions API | 7.2 |
| Consumption Reporting Provisioning API | 7.7 |
| M5d | Service Access Information API | 11.2 |
| Consumption Reporting API | 11.3 |
| Dynamic Policy invocation | The 5GMSd Client activates different traffic treatment policies selected from a set of Policy Templates configured in its Provisioning Session. | M1d | Provisioning Sessions API | 7.2 |
| Policy Templates Provisioning API | 7.9 |
| M5d | Service Access Information API | 11.2 |
| Dynamic Policies API | 11.5 |
| Network Assistance | The 5GMSd Client requests bit rate recommendations and delivery boosts from the 5GMSd AF. | M5d | Service Access Information API | 11.2 |
| Network Assistance API | 11.6 |
| Edge content processing | Edge resources are provisioned for processing content in 5GMS downlink media streaming sessions. | M1d | Provisioning Sessions API | 7.2 |
|  | Edge Resources Provisioning API | 7.10 |
| M5d | Service Access Information API | 11.2 |
| 5GMS via eMBMS | The 5GMSd AF provisions the delivery of content via eMBMS and MBMS User Services. | M1d | Provisioning Sessions API | 7.2 |
| M5d | Service Access Information API | 11.2 |
| M4d | MPEG‑DASH [4] or 3GP‑DASH [37] or HLS | 10 |
| 5GMS via MBS | The 5GMSd AF provisions the delivery of content via MBS User Services. | M1d | Provisioning Sessions API | 7.2 |
| M5d | Service Access Information API | 11.2 |
| M4d | MPEG‑DASH [4] or 3GP-DASH [37] or HLS | 10 |
| 5GMS via eMBMS | The 5GMSd AF provisions the delivery of content via eMBMS. | M1d | Provisioning Sessions API | 7.2 |
| M5d | Service Access Information API | 11.2 |
| M4d | MPEG‑DASH [4] or 3GP‑DASH [37] or HLS content distribution | 10 |
| UE data collection, reporting and exposure | UE data related to downlink 5G Media Streaming is reported to the Data Collection AF instantiated in the 5GMSd AF for exposure to Event consumers. | M1d | Event Data Processing Provisioning API | 7.11 |
| R4 | Ndcaf\_DataReporting service | 17 |
| R5, R6 | Naf\_EventExposure service | 18 |

## 4.3 Procedures of the M1 (5GMS Provisioning) interface

### 4.3.1 General

A 5GMS Application Provider may use the procedures in this clause to provision the network for media streaming sessions that are operated by that 5GMS Application Provider. For downlink media streaming, these sessions may be DASH streaming sessions, progressive download sessions, or any other type of media streaming or distribution (e.g. HLS) sessions. For uplink media streaming, the content format and delivery protocol are defined by the 5GMSu Application Provider, and may be either non-fully standardized or employ standardized HTTP-based streaming of ISO BMFF content fragments as profiled by CMAF [39].

Reference point M1 offers three different sets of procedures:

- For downlink media streaming, configuration of content ingest at reference point M2d or M10d for onward distribution by the 5GMSd AS over reference point M4d or via other distribution systems such as eMBMS or MBS. The API at this reference point is designed to offer equivalent functionality as that exposed by a public CDN. For uplink media streaming, configuration of content egest at reference point M2u or M10u for the media content received by the 5GMSu AS from the 5GMSu Client over reference point M4u. The resource types involved in content hosting configuration are provisioning session (see clause 4.3.2), content hosting procedures (see clause 4.3.3), ingest protocols (see clause 4.3.4), content preparation template (see clause 4.3.5), and server certificates (see clause 4.3.6).

- Configuration of dynamic policies: allows the configuration of Policy Templates at M5 that can be applied to M4 downlink/uplink media streaming sessions.

- Configuration of reporting: permits the MNO to collect, at M5, QoE metrics and consumption reports about M4 downlink sessions, as well as permits the MNO to collect, at M5, QoE metrics reports about M4 uplink sessions.

A 5GMS Application Provider may use any of these procedures, in any combination, to support its media streaming sessions.

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### 4.3.4 Content Protocols Discovery procedures

#### 4.3.4.1 General

The 5GMS Application Provider shall use the operations specified in clause 5.2.3 of TS 26.510 [56] at reference point M1 when it wants to discover the set of downlink content ingest or uplink content egest protocols supported by the 5GMS AS at reference point M2 and M10.

#### 4.3.4.2 Void

#### 4.3.4.3 Void

#### 4.3.4.4 Void

#### 4.3.4.5 Void

### 4.3.5 Content Preparation Template provisioning procedures

#### 4.3.5.1 General

For downlink media streaming, the 5GMSd AS may be required to process content ingested at reference point M2d or M10d before serving it from reference point M4d service locations. For uplink media streaming, the 5GMSu AS may be required to process content it receives from the 5GMSu Client before passing it to the 5GMSu Application Provider on the egest interface M2u.

The 5GMS Application Provider shall use the operations specified in clause 5.2.5 of TS 26.510 [56] at reference point M1 when it wants to create and subsequently manipulate Content Preparation Templates in the 5GMS AF.

#### 4.3.5.2 Void

#### 4.3.5.3 Void

#### 4.3.5.4 Void

#### 4.3.5.5 Void

### 4.3.6 Server Certificate provisioning procedures

#### 4.3.6.1 General

Each X.509 server certificate [8] presented by the 5GMSd AS at reference point M4d service locations or at reference point xMB-U is represented by a Server Certificate resource at M1d. The 5GMS Application Provider shall use the operations specified in clause 5.2.4 of TS 26.510 [56] at reference point M1 when it wants to create and subsequently manipulate Server Certificates in the 5GMS AF. These enable a Server Certificate resource to be created within the scope of a Provisioning Session, and subsequently referenced by a Content Hosting Configuration created in the scope of the same Provisioning Session.

NOTE: As a consumer of media from the 5GMSd AS in a combined architecture using 5GMS and eMBMS, the BM‑SC needs to be able to trust the content it is receiving comes from a *bona fide* source. This issue is left to implementation. Likewise, in the case of a combined architecture using 5GMS and MBS, the MBSTF needs to be able to trust the content it ingests.

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### 4.6.1 Procedures for DASH session

This procedure is used by a 5GMSd Client to establish a DASH session via the M4d interface. In order to establish such a session, the 5GMSd AS shall host an MPD as defined in ISO/IEC 23009-1 [32] or TS 26.247 [4] and the MPD URL is known to the 5GMSd Client typically using M8d.

The Media Player receives an MPD URL from the 5GMSd-Aware Application through M7d by methods defined in clause 13. The Media Player shall send an HTTP GET message to the 5GMSd AS including the URL of the MPD resource. On success, the 5GMSd AS shall respond with a 200 (OK) message that includes the requested MPD resource.

Additional procedures for reactions to different HTTP status codes are provided in TS 26.247 [4], clause A.7 and ISO/IEC 23009-1 [32] clause A.7.

Additional procedures for handling partial file responses are provided in TS 26.247 [4], clause A.9.

This information is provided through M7d to the application for selection. In addition, the currently used service description parameters are provided as status information at reference point M11d in order for the Media Session Handler to make use of this information, for example for Dynamic Policy and Network Assistance.

The detailed handling of service description information is documented in clause 13.2 of the present document.

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### 4.6.3 Procedures for using multiple service locations

These procedures may be used to augment the procedures described in clauses 4.6.1 and 4.6.2 above to allow for media resources to be obtained from multiple service locations exposed by the 5GMSd AS at reference point M4d.

Information required by the 5GMSd Client to access media from multiple service locations exposed at M4d by the 5GMSd AS is contained within a Media Player Entry document. This information may exist, for example, within:

- An MPD as XML elements or attributes containing the required information.

- A Media Player Entry document containing a pointer (e.g., URL) to an MPD or 3GP/MP4 file.

- A document pointed to by a Media Player Entry.

Examples of Media Player Entry documents are provided in Annex H.

A 5GMSd Client may use this information to do any or all of the following:

1. Switch between service locations exposed at reference point M4d during the downlink media streaming session.

2. Obtain signalling via reference point M4d from a content steering service provided by the 5GMSd AS or 5GMSd Application Provider that can be used to influence the choice of one service location over another, as specified in clause 10.2.2.

3. Access media resources from multiple service locations simultaneously using multi-source object coding, as specified in clause 10.3A.

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#### 4.7.2.1 General

Service Access Information is the set of parameters and addresses needed by the 5GMSd Client to activate reception of a downlink media streaming session or by a 5GMSu Client to activate an uplink media streaming session for contribution. Service Access Information additionally includes configuration information to allow the Media Session Handler to invoke procedures for dynamic policy (see clause 4.7.3), consumption reporting (clause 4.7.4), metrics reporting (clause 4.7.5) and network assistance (clause 4.7.6).

The Media Session Handler may obtain Service Access Information from either the 5GMS-Aware Application (via reference point M6) or from the 5GMS AF (via reference point M5). In the former case, the Service Access Information is initially acquired by the 5GMS-Aware Application from the 5GMS Application Provider via reference point M8. In the latter case, the Media Session Handler shall use the operations specified in clause 5.3.2 of TS 26.510 [56] at reference point M5 to acquire Service Access Information from the 5GMS AF, citing an external service identifier and the Service Access Information is derived by the 5GMS AF from the Provisioning Session established at reference point M1 (see clause 4.3.2) that is tagged with the same external service identifier.

Typically, the Service Access Information for media streaming includes a set of Media Entry Points (e.g. a set of pointers to documents that provide additional details for different streaming session configurations and/or define equivalent media presentations such as a DASH MPD, or a URL to a progressive download file) that can be consumed by the Media Stream Handler (Media Player or Media Streamer). One of these is selected by the Media Session Handler or by the 5GMS-Aware Application and is handed to the Media Player via reference point M11 or M7 respectively.

For downlink media streaming exclusively via eMBMS and for hybrid 5GMSd/eMBMS services as defined in clauses 5.10.2 and 5.10.5 respectively of TS 26.501 [2], the Service Access Information indicates that the 5GMSd Client acts as an MBMS-Aware Application.

For dynamically provisioned downlink media streaming via eMBMS as defined in clause 5.10.6 of TS 26.501 [2], the 5GMSd AS creates a presentation manifest that is regularly polled by the Media Player for a potential update. When an eMBMS User Service carrying the 5GMSd content is dynamically provisioned or removed by the 5GMSd AF, the 5GMSd AS shall update the presentation manifest with the locations where the updated manifest and the media segments are now available, for example to add or change to the media server in the MBMS Client.

For downlink media streaming exclusively via MBS and for hybrid 5GMSd/MBS services as defined in clauses 5.12.2 and 5.12.4 respectively of TS 26.501 [2], the Service Access Information indicates that the 5GMSd Client acts as an MBS-Aware Application.

For dynamically provisioned downlink media streaming via MBS as defined in clause 5.12.4 of TS 26.501 [2], the 5GMSd AS creates or hosts a presentation manifest that is regularly polled by the Media Player for a potential update. When an MBS User Service carrying the 5GMSd content is dynamically provisioned or removed by the 5GMSd AF, the 5GMSd AS shall update the presentation manifest with the resource locations where the updated manifest and the media segments are now available, for example to additionally or alternatively point to the Media Server in the MBSTF Client.

If an Edge Resources Configuration with client-driven management is provisioned, a Client Edge Resources Configuration is included in the corresponding Service Access Information.

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## 4.10A Procedures of the M10d interface

The following 5GMS AS service chaining protocols are specified by the present document at reference point M10d to support downlink media streaming:

- An *HTTP pull-based content ingest protocol* is specified in clause 8.2, including specific handling for HTTP redirects issued to the 5GMS AS by the 5GMS Application Provider's origin server.

- A *DASH-IF push-based content ingest protocol* is specified in clause 8.3.

## ===== CHANGE =====

## 4.10B Procedures of the M13d interface

No specific procedures are defined, but it is expected that the Media Stream Handler and 5GMSd Application Provider follow similar procedures as those defined between the Media Stream Handler and 5GMSd AS for media streaming as outlined in clause 4.6 for use at reference point M4d.

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#### 6.0.2.2 Canonical 5GMS AS authority at reference point M4

Media Entry Points provisioned in distribution configurations of a Content Hosting Configuration or in contribution configurations of Content Publishing Configuration shall be exposed by the 5GMS AS at reference point M4 from endpoint(s) with the following canonical domain name:

{modifiedExternalServiceId}.ms.as.3gppservices.org

where {modifiedExternalServiceId} is a modified form of the external service identifier indicated by the 5GMS Application Provider in the parent Provisioning Session resource at reference point M1 (see clause 4.3.2) in which each period character ('.') is replaced with a single hyphen character ('-').

For example, the canonical 5GMS AS domain name for a Content Hosting Configuration or Content Publishing Configuration created under the Provisioning Session with external service identifier com.provider.service is:

com-provider-service.ms.as.3gppservices.org

The DNS service provided by the 5G System shall resolve each such canonical domain name to the IP address(es) of deployed 5GMS AS instance(s) providing content hosting or content publishing endpoint(s) at reference point M4 on behalf of the parent Provisioning Session in question.

NOTE: Access to the 5GMS AS using domain name aliases at this reference point is not precluded.

The 5GMS AS shall expose all endpoints at reference point M4 via the default listening port number(s) for the version(s) of HTTP specified in clause 6.2.1.2 for use at this reference point.

## ===== CHANGE =====

#### 6.2.1.2 5GMS AS

Implementations of the 5GMS AS shall expose HTTP/1.1 [24] endpoints at reference points M2, M4 and M10; and implementations may additionally expose HTTP/2 [31] endpoints at these reference points. In both protocol versions, TLS [16] shall be supported and HTTPS interactions should be used in preference to cleartext HTTP.

For pull-based content ingest into the 5GMSd AS:

- The 5GMSd Application Provider shall expose an HTTP/1.1-based origin endpoint to the 5GMSd AS at reference point M2d and may additionally expose HTTP/2- and/or HTTP/3-based origin endpoints at this reference point.

- The 5GMSd AS shall expose an HTTP/1.1-based origin endpoint at reference point M10d and may additionally expose HTTP/2- and/or HTTP/3-based origin endpoints at this reference point.

For push-based content ingest into the 5GMSd AS:

- The 5GMSd Application Provider may use any supported HTTP protocol version to push content at reference point M2.

- The 5GMSd AS may use any supported HTTP protocol version to push content at reference point M10.

For pull-based content egest from the 5GMSu AS:

- The 5GMSu AS shall expose an HTTP/1.1-based origin endpoint to the 5GMSu Application Provider at reference point M2u and may additionally expose HTTP/2- and/or HTTP/3-based origin endpoints at this reference point.

- The 5GMSu AS shall expose an HTTP/1.1-based origin endpoint at reference point M10u and may additionally expose HTTP/2- and/or HTTP/3-based origin endpoints at this reference point.

For push-based content egest from the 5GMSu AS:

- The 5GMSu AS may use any supported HTTP protocol version to push content to the 5GMSu Application Provider at reference point M2u.

- The 5GMSu AS may use any supported HTTP protocol version to push content at reference point M10u.

Implementations of the 5GMS AS should expose HTTP/3 [60] endpoints at reference point M4. In HTTP/3, the QUIC protocol [58] is used for transport, and TLS [59] is used for the initial handshake and key exchange.

The 5GMS AF may use any supported HTTP protocol version at reference point M3.

The Media Stream Handler may use any supported HTTP protocol version at reference point M4.

## ===== CHANGE =====

## 7.4 Content Preparation Templates Provisioning API

### 7.4.1 Overview

The API used by the 5GMS Application Provider at reference point M1 to instantiate and manipulate Content Preparation Templates associated with a particular downlink or uplink media streaming Provisioning Session in the 5GMS AF is specified in clause 8.5 of TS 26.510 [56]. Content Preparation Templates are used to specify manipulations applied by a 5GMS AS to downlink media resources ingested at reference point M2d or M10d for distribution at interface M4d, or to uplink media resources contributed at reference point M4u or M10u for egest at interface M2u. The Content Preparation Templates Provisioning API is used to provision a Content Preparation Template within the scope of a Provisioning Session that can subsequently be referenced from a Content Hosting Configuration.

## ===== Content Hosting Provisioning API =====

### 7.6.1 Overview

The API used by the 5GMSd Application Provider at reference point M1d to create and manipulate the 5GMSd AS Content Hosting Configuration associated with a particular downlink media streaming Provisioning Session in the 5GMSd AF is specified in clause 8.8 of TS 26.510 [56].

Within a Content Hosting Configuration, one or more distribution configurations may be defined where each may specify different content caching, purging, and preparation behaviours for content ingested at reference point M2d or M10d. The Content Hosting Configuration may further specify, through the definition of affinity groups and geo-fencing, how reference point M4d service locations associated with each distribution configuration are deployed in the 5GMS System.

## ===== CHANGE =====

### 7.6.4 5GMSd AS functions supporting Content Hosting

#### 7.6.4.1 Overview

This clause defines the behaviour that is expected from the 5GMSd AS when the Content Hosting Configuration has been successfully provisioned as specified in clause 5.2.8 of TS 26.510 [56]. The main operations that are performed affect content caching, purging of cached content, as well as media processing for content preparation prior to distribution from one or more service locations.

#### 7.6.4.2 Content caching

A distribution configuration defined within the Content Hosting Configuration may specify caching rules to be applied to media resources and their derivatives (e.g., see clause 7.6.4.4) when they are distributed by the 5GMSd AS from reference point M4d service locations. The 5GMSd AS shall use the DistributionConfiguration.CachingConfiguration.urlPatternFilter of the Content Hosting Configuration resource specified in clause 8.8.3.1 of TS 26.510 [56] to determine which caching directives apply to that media resource or its derivatives (e.g., see clause 7.6.4.4). In the case where a distribution configuration has multiple cachingConfigurations and a media resource’s URL matches the pattern filter of more than one, the first match shall apply. In case no cachingConfiguration is identified as a match, the 5GMSd AS shall apply the caching directives that were received from the upstream ingest source at reference point M2d or M10d; or, in the absence of these, shall apply default caching directives as defined in clause 8.8.3.1 of TS 26.510 [56] based on the media resource type.

A caching directive shall indicate that a matching media resource or its derivatives (e.g., see clause 7.6.4.4) is:

- Not to be cached by the 5GMSd AS, nor by downstream M4d clients, when noCache is set to true, or

- To be cached for maxAge seconds by the 5GMSd AS, and potentially by downstream M4d clients, when noCache is set to false.

The maxAge value applies relative to the time when a media resource was ingested by the 5GMSd AS, defined here as t\_ingest regardless of whether or not it is further modified by a Content Preparation Template. For an HTTP-based ingest, this corresponds to the Date header field in the HTTP request/response that carries the media resource at M2d or M10d. At the time t\_ingest + maxAge, the media resource and its derivatives are considered stale and should not be served from the 5GMSd AS cache. The 5GMSd AS shall compensate for any synchronization skew between the origin and its own clock. For instance, this can be done by including the max-stale HTTP cache directive in HTTP responses sent from reference point M4d service locations.

The maxAge value may be signalled by the 5GMSd AS at reference point M4 service locations using the Expires HTTP response header or the HTTP Cache-Control directives max‑age or s‑maxage.

When distributing a media resource or its derivatives (e.g., see clause 7.6.4.4) using HTTP, a no-cache request may be translated into a no-cache and no-store HTTP Cache-Control directive and/or a max-age=0 HTTP Cache-Control directive.

By default, all origin HTTP header fields shall be assumed as not forwarded by the 5GMSd AS, unless specified otherwise by setting the flag originCacheHeaders to true.

#### 7.6.4.3 Cache purging

The 5GMSd Application Provider shall use the procedures and operations specified in clause 5.2.8.6 of TS 26.510 [56] to invalidate some or all cached media resources of a particular Content Hosting Configuration. As a consequence, the 5GMSd AF shall invoke an operation on the 5GMSd AS at reference point M3d to remove those media resources and their derivatives (e.g., in the case the media resource has been modified by a Content Preparation Template – see clause 7.6.4.4) from the 5GMSd AS cache across all distribution configurations associated with that Content Hosting Configuration, as specified in clause 9.

#### 7.6.4.4 Content preparation

The 5GMSd AS may be required to perform various content processing tasks (such as repackaging, encryption, ABR transcoding, multi-source object coding, etc.) on media resources ingested at reference point M2d or M10d prior to distributing them from reference point M4d service locations. These processing tasks shall be specified in a Content Preparation Template resource referenced from a distribution configuration within the Content Hosting Configuration.

#### 7.6.4.5 URL signing

The URL signing procedure allows the 5GMSd Application Provider to prevent deep linking and unauthorized access to M4d media resources. It works by cryptographically signing some elements of the M4d request URL and then appending this authentication token to the URL as an additional query parameter. The token is generated by the 5GMSd Application Provider and supplied to the player, for example as part of an initial URL. When it receives a request that requires URL signing, the 5GMSd AS verifies the presence and validity of the token in the M4d request URL before allowing access to the requested media resource. The 5GMSd AS instance(s) and the origin share a secret that is encoded as part of the query parameter hash, but not shared with the 5GMSd Media Player.

The validity of the authentication token can also be limited to a single UE. If useIPAddress is set to True, then the public IP address of the UE as viewed by the 5GMSd AS, ue\_public\_ip\_address, shall be incorporated into the token calculation. The parameter name shall be indicated by ipAddressName.

The shared secret shall be provided in the urlSignature.passphrase property of the Content Hosting Configuration resource. The parameter name for the passphrase to be used in the authentication token shall be provided by passphraseName.

The expiry time of the signed URL, tokenExpiry, shall be included as an additional query parameter in the URL exposed at M4d with the name indicated in tokenExpiryName. The expiry time shall be the string representation of the number of seconds from 1970-01-01T00:00:00Z UTC until the desired expiry UTC date/time, ignoring leap seconds, as defined in section 4.16 of POSIX.1 [11].

Given the above, the authentication token shall be calculated as:

token := SHA512(url&UrlSignature.tokenExpiryName=token\_expiry&UrlSignature.ipAddressName=‌ue\_public\_ip\_address&‌UrlSignature.passphraseName=passphrase)

where the SHA512 function shall be the SHA‑512 hash [6] of the enclosed string. The url parameter shall be the original M4d media resource request URL, including the scheme, authority and path components but excluding any query and fragment components.

The resulting token value shall be “base64url” encoded, as specified in section 5 of RFC 4648 [10], prior to inclusion in the M4d URL.

The query part of the signed URL presented by the 5GMSd Media Player at M4d as proof of authenticity shall be composed as follows:

query := urlSignature.tokenExpiryName=token\_expiry&urlSignature.tokenName=base64url(token)

For all media resources requested at reference point M4d that match the regular expression specified in urlSignature.‌urlPattern, whether modified by the Media AS or not, the 5GMSd AS shall validate the query presented in the request URL according to the following steps:

1) If the parameter indicated by urlSignature.tokenName is absent from query, or if the supplied token value is malformed, the 5GMSd AS shall respond with a 403 (Forbidden) error response message and terminate further processing of the M4d request.

2) If the parameter indicated by urlSignature.tokenExpiryName is absent from query, or if the supplied token\_expiry value has expired, or if the supplied token\_expiry is malformed, the 5GMSd AS shall respond with a 403 (Forbidden) error response message and terminate further processing of the M4d request.

3) The 5GMSd AS shall compute the authentication token according to the token production specified above using the requesting UE’s public IP address as the value of ue\_public\_ip\_address if required by urlSignature.useIPAddress being set to True. After applying “base64url” encoding, the 5GMSd AS shall compare this with the value supplied in the URL query parameter whose name is urlSignature.tokenName. If the two values differ, the 5GMSd AS shall respond with a 403 (Forbidden) error response message and terminate further processing of the M4d request.

4) Otherwise, the presented authentication token is valid. The 5GMSd AS shall either return the media resource in a 200 (OK) response message (if it is able to serve that media resource), or else return an appropriate error response, such as 404 (Not Found) or 503 (Service Unavailable).

#### 7.6.4.6 Geofencing

The 5GMSd Application Provider may wish to limit access to the media content it makes available at reference point M2d to UEs located in certain geographical zones. Geofencing is used to configure the zone from which content is accessible.

The geoFencing.locatorType shall be set to one of the controlled term identifiers in the first column of table B.1‑1 of TS 26.510 [56] and each member of the geoFencing.locators array in the distribution configuration shall then be set as specified in the third column of that table.

#### 7.6.4.7 Service chaining

The 5GMSd Application Provider may chain content hosting services hosted on two or more 5GMSd AS instances by provisioning two or more Content Hosting Configurations where:

- At least one Content Hosting Configuration ingests media content from the 5GMSd Application Provider at reference point M2d.

- Additional Content Hosting Configurations ingest media content from an upstream 5GMSd AS at reference point M10d where the IngestConfiguration.baseURL property of the Content Hosting Configuration (see table 8.8.3.1-1 of TS 26.510 [56]) corresponds to the DistributionConfiguration.baseURL property of an already provisioned Content Hosting Configuration in the upstream 5GMSd AS.

#### 7.6.4.8 Service location deployment

Reference point M4d service locations associated with distribution configurations within the Content Hosting Configuration shall be deployed within the 5GMS System at the discretion of the 5GMSd AF taking into account any deployment affinity requirements and geo-fencing rules as specified below.

The DistributionConfiguration.affinityGroup property within the Content Hosting Configuration (see table 8.8.3.1-1 of TS 26.510 [56]) may be defined by the 5GMSd Application Provider to guide deployment of service locations within the 5GMSd AS according to the following:

- The affinityGroup property applies only to those distribution configurations defined within a single Content Hosting Configuration. Service locations associated with distribution configurations with the same affinityGroup value but belong to different Content Hosting Configurations may or may not be deployed together within the 5GMSd AS at the discretion of the 5GMSd AF.

- When any two distribution configurations have the same affinityGroup value or the property or it is not defined anywhere within a Content Hosting Configuration, the deployment of service locations within the 5GMSd AS is at the discretion of the 5GMSd AF.

- When any two distribution configurations defined within a single Content Hosting Configuration have different affinityGroup values (including those that are not defined), service locations associated with one distribution configuration will not be deployed together with (e.g., at the same physical location) service locations associated with the other distribution configuration.

The DistributionConfiguration.geoFencing property within the Content Hosting Configuration (see table 8.8.3.1-1 of TS 26.510 [56]) may be defined by the 5GMSd Application Provider for limiting access to content based on geographic location. The deployment of service locations (e.g., physical location) distributing content where geofencing is enforced is at the discretion of the 5GMSd AF.

## ===== CHANGE =====

# 8 Media ingest and publish (M2 and M10) protocols

## 8.1 General

The set of content protocols supported by the 5GMS AS is listed in table 8.1-1 below:

Table 8.1-1: Supported content protocols

| Description | Term identifier | Clause |
| --- | --- | --- |
| Content ingest protocols at reference point M2d or M10d | | |
| HTTP pull-based content ingest protocol | urn:3gpp:5gms:content-protocol:http-pull or urn:3gpp:5gms:content-protocol:http-pull-ingest (see NOTE) | 8.2 |
| DASH-IF push-based content ingest protocol | <http://dashif.org/ingest/v1.2>/interface-1 or http://dashif.org/ingest/v1.2/interface-2 or urn:3gpp:5gms:content-protocol:dash-if-ingest (see NOTE) | 8.3 |
| HTTP low-latency pull-based content ingest protocol | urn:3gpp:5gms:content-protocol:http-ll-pull | 8.4 |
| Content egest protocols at reference point M2u or M10u | | |
| HTTP pull-based content egest protocol | urn:3gpp:5gms:content-protocol:http-pull | 8.5 |
| DASH-IF push-based content egest protocol | http://dashif.org/ingest/v1.2/interface-1 or http://dashif.org/ingest/v1.2/interface-2 | 8.6 |
| HTTP low-latency pull-based content egest protocol | urn:3gpp:5gms:content-protocol:http-ll-pull | 8.7 |
| NOTE: Term identifier deprecated in this version of the present document. | | |

## 8.2 HTTP pull-based content ingest protocol

The following provisions shall apply if IngestConfiguration.protocol is set to urn:3gpp:‌5gms:‌content-protocol:‌http-pull or to the deprecated value urn:‌3gpp:‌5gms:‌content-protocol:‌http-pull in the Content Hosting Configuration:

- Media resources shall be ingested by the 5GMSd AS from the 5GMSd Application Provider or from another 5GMSd AS using HTTP [25].

NOTE 0: Any supported HTTP protocol version may be used for HTTP pull-based content ingest at reference point M2d or M10d.

- The IngestConfiguration.mode property shall be set to PULL, indicating that a pull-based protocol is used.

- The IngestConfiguration.baseURL property shall point at the 5GMSd Application Provider's origin server or the DistributionConfiguration.baseURL property of another Content Hosting Configuration, as specified in table 8.8.3.1 of TS 26.510 [56], and may indicate the use of HTTPS [30].

When the 5GMSd AS receives a request for a media resource at a reference point M4d service location that cannot be satisfied from its content cache, the request shall be transformed into a corresponding HTTP GET request directed to the 5GMSd Application Provider's origin server via interface M2d or to another 5GMSd AS via reference point M10d as follows:

1. The prefix of the request URL indicated in the Distribution‌Configuration.‌baseURL of the applicable Content Hosting Configuration is replaced with that of the corresponding Ingest‌Configuration‌.baseURL.

NOTE 1: It is the responsibility of the 5GMSd AF to assign unique M4d and M10d base URLs to each provisioned Content Hosting Configuration so as to ensure that this substitution is unambiguous.

2. The path rewrite rules (if provisioned in DistributionConfiguration.pathRewriteRules) are applied in strict order to the remainder of the request URL (i.e., the path segments following Distribution‌Configuration.‌baseURL). The requestPathPattern of the first matching path rewrite rule is replaced with the corresponding mappedPath.

In the case where the 5GMSd Application Provider's origin server or an upstream 5GMSd AS issues an HTTP 3xx redirect at reference point M2d or M10d respectively pointing to another location, the 5GMSd AS shall issue an equivalent HTTP redirect to the Media Player via reference point M4d whose location is a dynamically generated M4d endpoint. Requests to this location shall be rewritten by the 5GMSd AS to the target location of the M2d or M10d redirection, as appropriate.

NOTE 2: This explicit handling of HTTP redirects received by the 5GMSd AS at reference point M2d or M10d ensures that it is not bypassed by the Media Player. The general concept underlying this is commonly referred to as a "reverse mapping rule" by HTTP reverse proxies.

## 8.3 DASH-IF push-based content ingest protocol

The following provisions shall apply if IngestConfiguration.protocol is set to http://dashif.org/‌ingest/‌v1.2‌/interface-1 or http://dashif.org/‌ingest/‌v1.2/‌interface-2 or to the deprecated value urn:‌3gpp:‌5gms:‌content-protocol:‌dash-if-ingest in the Content Hosting Configuration:

- Media resources shall be published by the 5GMSd Application Provider to the 5GMSd AS as specified by the DASH‑IF Live Media Ingest specification [3].

NOTE: The protocol in [3] is specified for use with HTTP/1.1 [24] only.

- The IngestConfiguration.mode property shall be set to PUSH, indicating that a push-based protocol is used.

- The IngestConfiguration.baseURL property shall be set by the 5GMSd AF to the base URL that is to be used by the 5GMSd Application Provider or by an upstream 5GMSd AS to upload the DASH segments and MPD(s) to the 5GMSd AS at reference point M2d or M10d respectively.

## 8.4 HTTP low-latency pull-based content ingest protocol

The provisions specified in clause 8.2 shall apply if IngestConfiguration.protocol is set to urn:3gpp:‌5gms:‌content-protocol:‌http-ll-pull.

In addition, if HTTP/1.1 [24] is used at reference point M2d or M10d:

- The requesting 5GMSd AS shall make partially received media segments available immediately for retrieval by 5GMS Clients at reference point M4d or M10d instead of waiting until the full segment is received.

- The 5GMSd Application Provider should use HTTP chunked transfer coding as defined in section 7.1 of [24]. In this case, the requesting 5GMSd AS shall accept chunked HTTP/1.1 response messages and shall make partially received media segments (i.e., HTTP Chunks) available immediately for retrieval by 5GMS Clients at reference point M4d or M10d instead of waiting until the full segment is received.

- If the DASH-IF Low Latency mode as defined in [63] is used, then the content is packaged as a series of CMAF Segments [40]. Further, each CMAF Segment is typically subdivided into one or more multiple CMAF Chunks to support low-latency content generation. According to the DASH‑IF Live Media Ingest specification [3], each HTTP Chunk should contain at most one CMAF Chunk in order to minimise the latency.

NOTE: Usage of HTTP/2 and HTTP/3 at reference points M2d and M10d is for future study.

## 8.5 HTTP pull-based content egest protocol

If EgestConfiguration.‌protocol is set to urn:3gpp:‌5gms:‌content-protocol:‌http-pull-egest in the Content Publishing Configuration, media resources shall be retrieved by the 5GMSu Application Provider from the 5GMSu AS at reference point M2u or by an upstream 5GMSu AS at reference point M10u using HTTP [25]. Media segments contributed to the 5GMSu AS by the 5GMSu Client shall be processed according to the Content Preparation Template(s) specified in the corresponding Content Publishing Configuration (if any) prior to making them available at reference point M2u or M10u.

In this case:

- The EgestConfiguration.‌mode property shall be set to PULL, indicating that a pull-based protocol is used.

- The EgestConfiguration.‌baseURL property shall be set by the 5GMSu AF to the base URL on the 5GMSu AS where it will publish media segments, presentation manifests and metadata for retrieval by the 5GMSu Application Provider at reference point M2u or by an upstream 5GMSu AS at reference point M10u.

- The EgestConfiguration.‌entryPoint.‌relativePath property shall point at a Media Entry Point document below this base URL, as specified in table 8.9.3.1 of TS 26.510 [56], and may indicate the use of HTTPS [30]. This document describes the location of media content and associated metadata exposed by the 5GMSu AS at reference point M2u or M10u which are expected to be pulled by the 5GMSu Application Provider or by an upstream 5GMSu AS respectively.

In the absence of content preparation, the 5GMSu AS shall publish media resources by replacing the prefix Contribution‌Configuration.‌baseURL of its URL at M4u with that of the corresponding EgestConfiguration.‌baseURL.

## 8.6 DASH-IF push-based content egest protocol

If EgestConfiguration.‌protocol is set to http://dashif.org/‌ingest/‌v1.2/‌interface-1 or http://dashif.org/‌ingest/‌v1.2/‌interface-2 in the Content Publishing Configuration, media resources shall be published by the 5GMSu AS to the 5GMSu Application Provider at reference point M2u or to an upstream 5GMSu AS at reference point M10u as specified in the DASH‑IF Live Media Ingest specification [3]. Media segments contributed to the 5GMSu AS by the 5GMSu Client shall be processed according to the Content Preparation Template(s) specified in the corresponding Content Publishing Configuration (if any) prior to publishing them at reference point M2u or M10u.

NOTE 1: The protocol in [3] is specified for use with HTTP/1.1 [24] only.

NOTE 2: A 5GMSu AS implementation that advertises support for the egest of content at reference point M2u or M10u using interface 2 of the DASH-IF Live Media Ingest specification [3] is required to produce a suitable DASH presentation manifest.

In this case:

- The EgestConfiguration.‌mode property shall be set to PUSH, indicating that a push-based protocol is used.

- The EgestConfiguration.‌baseURL property shall be set by the 5GMSu Application Provider to the base URL that is to be used by the 5GMSu AS to upload media segments and presentation manifests to the 5GMSu Application Provider at reference point M2u or to an upstream 5GMSu AS at reference point M10u.

If the 5GMSu Application Provider has provisioned an egest Media Entry Point, and if such document has been contributed to or produced by 5GMSu AS, the 5GMSu AS shall publish this document to the URL formed by the concatenation of EgestConfiguration.‌baseURL with EgestConfiguration.‌entryPoint.‌relativePath, as specified in table 8.9.3.1 of TS 26.510 [56]. This URL may indicate the use of HTTPS [30].

In the absence of any content preparation, each media resource uploaded at reference point M4u shall be published to the 5GMSu Application Provider at the URL formed by replacing the prefix Contribution‌Configuration.‌baseURL of its URL at M4u with that of the corresponding EgestConfiguration.‌baseURL.

## 8.7 HTTP low-latency pull-based content egest protocol

The following provisions shall apply if EgestConfiguration.protocol is set to urn:3gpp:5gms:content-protocol:http-ll-pull the following provisions shall apply.

The content shall be packaged as a series of CMAF Segments [40]. Each CMAF Segment shall be subdivided into multiple one or more CMAF Chunks.

In addition:

- If HTTP/1.1 [24] is used at reference point M2u or M10u, partially available media segments may be accessed by the 5GMSu Application Provider using an HTTP byte range request, as specified in section 14 of RFC 9110 [25]. If the 5GMS Application Provider makes a byte-range request for a partially available media segment (the first media segment it retrieves) and the first-pos of that range is non-zero and the 5GMS Application Provider is expecting an aggregating response, then the 5GMS Application Provider should signal that expectation following the convention of IETF RFC 8673 [61]. Specifically, it should use a last-pos value of 9007199254740991. In this case, the 5GMSu AS is required to respond with a 206 (Partial Content) HTTP response without a Content-length response header instead of waiting for the end of the segment and responding with a 200 (OK) HTTP response code.

## ===== CHANGE =====

# 10 Media Streaming (M4) interface

## 10.1 General

This clause specifies the interface for downlink and uplink media streaming at reference point M4 using different distribution formats and protocols. TS 26.511 [35] defines several media codecs and distribution formats for 5G Media Streaming. It also provides requirements and recommendations for the support of these media codecs and formats in profiles specific to 5G Media Streaming. However, 5GMS is not restricted to the media profiles and distribution formats defined in TS 26.511 [35]. For example, any CMAF media profile that integrates with the APIs specified in the present document may be used for media streaming at reference point M4.

## 10.1A Media delivery session identification

All media requests addressed by the Media Stream Handler (Media Player or Media Streamer) to the 5GMS AS at reference point M4 shall cite a media delivery session identifier using the HTTP header specified in clause 6.2.3.6. The value of this identifier shall be different for every media streaming session.

## 10.2 DASH distribution

### 10.2.1 Overview

In the case of DASH distribution, M4d is relevant for the distribution as shown in figure 10.2.1-1.



Figure 10.2.1-1: M4d usage for DASH distribution

For DASH-based distribution according to TS 26.247 [4] and ISO/IEC 23009-1 [32], two main formats are of relevance:

1) The Media Presentation Description (MPD) that is processed in the DASH Access Client.

2) The Segment formats that are passed through the DASH Access Client and processed in the Media Playback and Content Decryption Platform. Note that the DASH Access Client may parse Segments to extract, for example, In-band Events or producer reference times.

Other resources may be referenced in the MPD. Examples include:

- Service locations in the form of baseURL elements from which Segments can be downloaded.

- Content Steering instructions provided by a Content Steering Server as defined in ETSI TS 103 998 [67] (see clause 10.2.2).

- DRM-related information.

The Segment formats for DASH Streaming in the context of 5G Media Streaming are defined in TS 26.511 [35] based on the CMAF encapsulation. The DASH Access Client downloads the Segments from the 5GMSd AS based on the instructions in the MPD and the instructions from the 5GMSd-Aware Application through M7d (see clause 13 for details).

The interface between the DASH Access Client and the Media Playback and Content Decryption Platform as well as the 5GMSd Client requirements for media codecs are documented in TS 26.511 [35].

The following requirements apply at reference point M4d:

1) The Media Presentation Description (MPD) and Segments shall conform to an MPD according to ISO/IEC 23009-1 [32] or TS 26.247 [4].

2) The Segment formats should conform to CMAF addressable resources as well as to the requirements in TS 26.511 [35].

3) The Media Presentation should conform to the 5G Media Streaming DASH Interoperability Point as defined in clause 7.3.11 of TS 26.247 [4].

A 5GMSd Client shall support the 5G Media Streaming DASH Interoperability Point as defined in TS 26.247 [4], clause 7.3.11. A 5GMSd Client may support additional DASH profiles and interoperability points.

The MPD may contain a one or several ServiceDescription elements that include operational parameters. The MPD may also include multiple configurations for the media (different codecs, different content protection, different resolutions, etc.), for example for playback under different operating policies. The handling of this information is documented in clause 13.2.

If the media segment formats conform to CMAF addressable resources as defined ISO/IEC 23000-19 [27], the same CMAF content may then be provided for DASH and HLS. In order to support common deployment, the media segment content should conform to CTA‑5005‑A [62].

### 10.2.2 Content Steering for DASH

In the case when Content Steering is used, the DASH Access Client may communicate via reference point M4d with a Content Steering Server, as defined in ETSI TS 103 998 [67], provisioned within the 5GMSd AS.

Content steering information may be provided within the Media Player Entry (e.g., an MPD) or a document pointed to by the Media Player Entry. When this content steering information is provided within an MPD, the URL to the Content Steering server is provided within the ContentSteering element. This element may also include additional information, as described in clause 5.1 of ETSI TS 103 998 [67], that is used by the Access Client to:

- Determine the default service location.

- Resolve the response from the Content Steering Server prior to starting playback.

- Determine whether the Access Client is required to follow the content steering rules provided by the Content Steering Server or is free to decide whether to use the content steering information.

When obtaining content steering information from the Content Steering Server, the Access Client should use an HTTP GET request. Request URL query parameters that provide the Access Client’s currently selected BaseURL and current prediction of the media download throughput may optionally be attached to the request as described in clause 8 of ETSI TS 103 998 [67].

## The Content Steering Server may provide a DASH Content Steering Manifest in response, as described in clause 6 of ETSI TS 103 998 [67], that is used by the Access Client to prioritize use of BaseURLs for accessing Segments from the 5GMSd AS.10.3 HTTP low-latency content distribution

When low-latency distribution of media content at reference point M4d is provisioned, then the following provisions shall apply:

- The 5GMSd AS shall make partially received media segments available immediately for retrieval by 5GMS Clients at reference point M4d instead of waiting until the full segment is received.

- the 5GMSd AS should use HTTP chunked transfer coding as defined in section 7.1 of [24]. In this case, the 5GMSd client shall accept chunked HTTP/1.1 response messages.

- If the DASH-IF Low Latency mode as defined in [63] is used as identifed in the MPD by the profile indicator http://www.dashif.org/guidelines/low-latency-live-v5, then the content is packaged as a series of CMAF Segments [40]. Further, each CMAF Segment is typically subdivided into one or more multiple CMAF Chunks to support low-latency content generation. According to the DASH‑IF Live Media Ingest specification [3], each HTTP Chunk should contain at most one CMAF Chunk in order to minimise the latency.

- At reference point M4d, the Media Player may access partially available media segments using an HTTP byte range request, as specified in section 14 of RFC 9110 [25]. (For details see for example [63] on Resynchronization Points.) If the Media Player makes a byte-range request for a partially available media segment (the first media segment it retrieves) and the first-pos of that range is non-zero and the Media Player is expecting an aggregating response, then the Media Player should signal that expectation following the convention of IETF RFC 8673 [61]. Specifically, it should use a last-pos value of 9007199254740991. In this case, the 5GMSd AS is required to respond with a 206 (Partial Content) HTTP response without a Content-length response header instead of waiting for the end of the segment and responding with a 200 (OK) HTTP response code.

## 10.3A HTTP content distribution using CMMF

CMMF, as documented in TS 26.511 [35] and ETSI TS 103 973 [68], can be used to augment the retrieval of media content at reference point M4d. (This is applicable to both DASH distribution as specified in clause 10.2 and to HTTP low-latency content distribution as specified in clause 10.3.) In such cases, media encoded and packaged within CMMF objects are downloaded from the 5GMSd AS at reference point M4d instead of the original media segments.

When CMMF is used, it is the responsibility of the Access Client to:

- Translate between the addresses of the CMAF resources described by an MPD and the CMMF objects available from the 5GMSd AS.

- Download CMMF objects corresponding to a CMAF resource (e.g., Segment) required by the Media Player. This may include downloading (either partially or in full) CMMF objects from one or more reference point M4d service locations.

- Decode and recover the requested resource (e.g., Segment).

The Access Client may use CMMF configuration information communicated within the Media Player Entry (or a document pointed to by the Media Player Entry) to locate and download CMMF objects from the 5GMSd AS that correspond to the CMAF resources described by an MPD as specified in clause ??? of TS 26.511 [35]. This applies to media segments that are either fully or partially (e.g., CMAF Chunks) available.

## 10.3A HTTP content distribution using object coding

Object coding can be used to augment the retrieval of media content at reference point M4d. (This is applicable to both DASH distribution as specified in clause 10.2 and to HTTP low-latency content distribution as specified in clause 10.3.) In such cases, media encoded and packaged within coded objects are downloaded from the 5GMSd AS at reference point M4d instead of the original media segments.

When object coding is used, it is the responsibility of the Access Client to:

- Translate between the addresses of the CMAF resources described by an MPD and the coded objects available from the 5GMSd AS.

- Download coded objects corresponding to a CMAF resource (e.g., Segment) required by the Media Player. This may include downloading (either partially or in full) coded objects from one or more reference point M4d service locations.

- Decode and recover the requested resource (e.g., Segment).

The Access Client may use configuration information communicated within the Media Player Entry (or a document pointed to by the Media Player Entry) to locate and download coded objects from the 5GMSd AS that correspond to the CMAF resources described by an MPD as specified in clause ??? of TS 26.511 [35]. This applies to media segments that are either fully or partially (e.g., CMAF Chunks) available.

## ===== CHANGE =====

### 11.3.3 Report format

#### 11.3.3.1 ConsumptionReport data type

The ConsumptionReport data type is specified in clause 9.6.3.1 of TS 26.510 [56].

In the case of downlink media streaming with DASH [32]:

- The mediaPlayerEntry shall be populated with the URL of the MPD resource, or a document pointing to the MPD resource, that was retrieved at reference point M4d.

- A separate Consumption Reporting Unit shall be reported in the consumptionReportingUnits array for each DASH Adaptation Set currently selected for presentation by the Media Player.

For other types of media streaming, the content of these properties is undefined.

## ===== CHANGE =====

# 12 UE Media Session Handling (M6/M11) APIs for uplink and downlink

## 12.1 General

This clause defines the client APIs for Media Session Handling to be used by other 5G System components such as a Media Player in a 5GMSd Client or the Media Streamer in a 5GMSu Client.

NOTE: Client-driven management of edge processing resources via reference point M6 or M11 is not specified in this release.

## 12.2 Media session handling for downlink media streaming – APIs and functions

### 12.2.1 Overview

In the following, it is assumed that the Media Session Handler for downlink media streaming adheres to a basic set of functionalities as shown in figure 12.2.1-1.



Figure 12.2.1-1: Usage of M6d in Media Downlink Streaming

The Media Session Handler is considered to run as a service in the background, and is invoked for a media session once a media player in the 5GMSd streaming client is activated with an MPD URL of media MIME type "application/dash+xml". Based on the MPD URL, the Media Session Handler may initiate communication with the 5GMSd AF through M5d.

NOTE: The initiation of the Media Session Handler for other media types than DASH is for further study.

For an ongoing 5G Media Streaming session, the Media Session Handler is given the following authorizations:

1) The ability to query the status of the Media Player at reference point M11d. For details see clause 13.

2) The ability to process notifications and errors received from the Media Player at reference point M11d. For details see clause 13.

3) The ability to configure certain parameters on the Media Player using methods exposed at reference point M11d. For details see clause 13.

In addition, the Media Session Handler provides information to the 5GMS-Aware Application at reference point M6d, possibly delegated to Media Player at reference point M11d for each of the Media Session Handler functionalities, namely providing:

1) Notification and Error Events;

2) Status Information.

The client API used for downlink media session handling at reference point M6d by the 5GMSd-Aware Application and at reference point M11d by the Media Player in a 5GMSd Client is specified in clause 11 of TS 26.510 [56].

## ===== CHANGE =====

## 12.3 Media session handling for uplink Streaming – APIs and functions

The client API used for uplink media session handling at reference point M6u by the 5GMSu-Aware Application and at reference point M11u by the Media Streamer in a 5GMSu Client is specified in clause 11 of TS 26.510 [56].

## ===== CHANGE =====

# 13 UE Media Stream Handler (M7/M11) APIs

## 13.1 General

This clause defines a set of APIs and methods that permit a 5GMS-Aware Application at reference point M7 or a Media Session Handler at reference point M11 to communicate with a Media Stream Handler (Media Player or Media Streamer). The main focus of this clause is to formalize and harmonize commonly available proprietary APIs in order to support the usage of a Media Player or a Media Streamer in a 5G Media Streaming context.

The APIs specified in this clause are language- and runtime-independent. Implementations are expected to provide language bindings appropriate to the UE runtime environment.

## 13.2 DASH Media Player APIs and functions

### 13.2.1 Overview

In the following, it is assumed that the Media Player (in this case a DASH client) adheres to a basic set of functionalities as shown in figure 13.2-1. The DASH client downloads, processes and presents a DASH Media Presentation under the control of a 5GMSd-Aware Application via reference point M7d or of the Media Session Handler via reference point M11d.

The 5GMSd-Aware Application may, in addition, configure the presentation of the media, receive notifications on events, or query the internal status of the DASH Player, also supported through reference point M7d. Different functions of the DASH Access Client that are typically necessary to process a DASH Media Presentation, are shown in figure 13.2-1. Additional functions may be available as well.



Figure 13.2.1-1: Architecture of DASH-based 5GMSd Client

The key functionalities of each of the functions as shown in figure 13.2-1 are summarized in the following:

- *5GMSd-Aware Application:* Application that makes use of the DASH-based Media Player to play back a DASH Media Presentation using the APIs defined in this clause.

- *Media Player:* A complete player for the playback of a Media Presentation, including the Media Playback and Content Decryption Platform as defined in TS 26.511 [35].

- *Access Client:* A part of the DASH Player that accesses and downloads of the resources and provides the downloaded resources to the Media Playback Platform and Content Decryption for the playback of DASH content.

- *Management:* Controls all internal processes and the communication with the 5GMSd-aware application. In particular this includes the handling of service descriptions and operation points.

- *MPD Processing:* parses and processes the MPD and extracts the relevant information.

- *Adaptation Set Selection:* selects the Adaptation Set based on user, application and/or device capability information. Information provided through M7d may be used.

- *ABR Controller and Dynamic Switching:* runs adaptive bit rate logic and triggers adaptive switching of Representations. Information provided to the DASH client through M7d may be used.

- *Throughput Estimation:* estimates the throughput from the 5GMSd Application Server.

- *Metrics Logging:* logs relevant low-level metrics and provides those to the metrics aggregation and reporting functions in the Media Session Handler.

- *Media Playback Management and Protection Controller:* manages the media playback by moving downloaded information into media playback platform and also addresses handling of protection and DRM related information.

- *Media Playback and Content Decryption Platform:* plays back CMAF-based media content according to the playback requirements in TS 26.511 [35]. It also provides status information as well as events that maybe be provided through M7d.

- *Event Processing:* Processes DASH events and provides information to the 5GMSd-Aware Application as defined in TS 26.247 [4].

- *Downloader:* Retrieves resources from one or more reference point M4d service locations. It may optionally support switching between service locations, communication with a Content Steering Server as described in clause 10.2.2, and the download and decoding of coded objects as described in clause 10.3A and TS 26.511 [35].

This clause focuses on interactions with the Media Player through reference point M7d. In particular, the following aspects of the API are defined:

1) Methods to interact with the Media Player at this reference point are defined in clause 13.2.3.

2) Notification and Error Events raised by the Media Player at this reference point are defined in clause 13.2.4.

3) Configuration and Settings of the Media Player at this reference point are defined in clause 13.2.5.

4) Status Information exposed by the Media Player at this reference point is defined in clause 13.2.6.

Communication between the Access Client and the media playback platform of the Media Player is defined in TS 26.511 [35].

A 5GMSd Client for DASH distribution shall support the APIs defined in this clause 13.

NOTE: The initial APIs have largely been designed based on the dash.js APIs documented here: <http://cdn.dashjs.org/latest/jsdoc>.

## ===== CHANGE =====

## 13.3 CMMF-enabled Access Client APIs and functions

Editor’s Note: TBD

## ===== CHANGE =====

Annex B (informative):  
Content Hosting Configuration examples

# B.1 Pull-based content ingest example

## B.1.1 Overview

1. The 5GMSd Client on the UE requests a media resource via M4d.

2. The 5GMSd AS determines that it does not have a cached copy of the requested media resource.

3. The 5GMSd AS transforms the M4d request URL into a request to the 5GMSd Application Provider's origin server via M2d.

## B.1.2 Desired URL mapping

In the example shown in table B.1.2‑1 below, media resources for the Provisioning Session with external identifier com.provider.service are exposed at M4d from a default canonical domain com-provider-service.‌ms.‌as.‌3gppservices.‌org determined by the 5GMSd System operator, and also from a custom domain name alias 5gms.provider.com that has been configured by the 5GMSd Application Provider.

Table B.1.2‑1: Example URL mapping for pull-based ingest

|  |  |
| --- | --- |
| M4d request from 5GMSd Client | Mapped M2d request to origin server on 5GMSd AS cache miss |
| https://**com-provider-service.ms.as.3gppservices.org**/‌**asset123456**/**video1**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**video1**/segment1000.mp4 |
| https://**5gms.provider.com**/‌**asset123456**/**video1**/segment1000.mp4 |
| https://**com-provider-service.ms.as.3gppservices.org**/‌**asset123456**/**video2**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**video2**/segment1000.mp4 |
| https://**5gms.provider.com**/‌**asset123456**/**video2**/segment1000.mp4 |
| https://**com-provider-service.ms.as.3gppservices.org**/‌**asset123456**/**audio1**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**audio1**/segment1000.mp4 |
| https://**5gms.provider.com**/‌**asset123456**/**audio1**/segment1000.mp4 |

## B.1.3 Content Hosting Configuration

Table B.1.3‑1 below shows the relevant Content Hosting Configuration parameters needed to achieve the example mapping described in table B.1.2‑1 above.

Table B.1.3‑1: Content Hosting Configuration properties relevant to pull-based ingest

|  |  |  |
| --- | --- | --- |
| Property | Example value | Set by |
| IngestConfiguration | | |
| protocol | urn:3gpp:5gms:content-protocol:**http-pull** | 5GMSd Application Provider *(M1d request)* |
| mode | PULL |
| baseURL | https://origin.provider.com/media |
| DistributionConfiguration | | |
| canonicalDomainName | com-provider-service.ms.as.3gppservices.org | 5GMSd AF *(M1d response)* |
| domainNameAlias | 5gms.provider.com | 5GMSd Application Provider *(M1d request)* |
| baseURL | https://5gms.provider.com/ | 5GMSd AF *(M1d response)* |

# B.2 Push-based content ingest example

## B.2.0 Overview

1. The 5GMSd Application Provider uploads content to the 5GMSd AS via M2d.

2. The 5GMSd AS rewrites the M2d upload URL to an M4d downlink URL that is exposed to the 5GMSd Client on the UE.

## B.2.1 Desired URL mapping

In the example shown in table B.2.1‑1, media resources for the Provisioning Session with external identifier com.provider.service are pushed into the 5GMSd AS at M2d by the 5GMSd Application Provider and exposed to the 5GMSd Client at M4d using the canonical name of the 5GMSd AS com-provider-service.‌ms.‌as.‌3gppservices.org and an additional domain name alias 5gmsd.provider.com configured by the 5GMSd Application Provider.

Table B.2.1‑1: Example URL mapping for push-based ingest

|  |  |
| --- | --- |
| M2d ingest URL pushed to 5GMSd AS | M4d URL exposed to 5GMSd Client |
| https://5gmsd-as.mno.net/com-provider-service/‌**asset123456**/**video1**/segment1000.mp4 | https://**com-provider-service.ms.as.3gppservices.org**/‌**asset123456**/**video1**/segment1000.mp4 |
| https://**5gms.provider.com**/‌**asset123456**/**video1**/segment1000.mp4 |
| https://5gmsd-as.mno.net/com-provider-service/‌**asset123456**/**video2**/segment1000.mp4 | https://**com-provider-service.ms.as.3gppservices.org**/‌**asset123456**/**video2**/segment1000.mp4 |
| https://**5gms.provider.com**/‌**asset123456**/**video2**/segment1000.mp4 |
| https://5gmsd-as.mno.net/com-provider-service/‌**asset123456**/**audio1**/segment1000.mp4 | https://**com-provider-service.ms.as.3gppservices.org**/‌**asset123456**/**audio1**/segment1000.mp4 |
| https://**5gms.provider.com**/‌**asset123456**/**audio1**/segment1000.mp4 |

## B.2.2 Content Hosting Configuration

Table B.2.2‑1 below shows the relevant Content Hosting Configuration parameters needed to achieve the example mapping described in table B.2.1‑1 above.

Table B.2.2‑1: Content Hosting Configuration properties relevant to push-based ingest

|  |  |  |
| --- | --- | --- |
| Property | Example value | Set by |
| IngestConfiguration | | |
| protocol | http://dashif.org/‌ingest/‌v1.2‌/interface-1 | 5GMSd Application Provider *(M1d request)* |
| mode | PUSH |
| baseURL | https://5gmsd-as.mno.net/‌com-provider-service/ | 5GMSd AF *(M1d response)* |
| DistributionConfiguration | | |
| canonicalDomainName | com-provider-service.ms.as.3gppservices.org | 5GMSd AF *(M1d response)* |
| domainNameAlias | 5gms.provider.com | 5GMSd Application Provider *(M1d request)* |
| baseURL | https://5gms.provider.com/ | 5GMSd AF *(M1d response)* |

# B.3 Pull-based content ingest with 5GMSd AS service chaining via M10d

### B.3.1 Overview

This example shows how to provision multiple Content Hosting Configurations allowing for content hosting service chaining via reference point M10d.

1. The 5GMSd Client on the UE requests a media resource via M4d.

2. The client-facing 5GMSd AS determines that it does not have a cached copy of the requested media resource.

3. The client-facing 5GMSd AS transforms the M4d request URL into a request to the origin server-facing 5GMSd AS via M10d.

4. The origin server-facing 5GMSd AS transforms the M10d request URL into a request to the 5GMSd Application Provider’s origin server via M2d.

### B.3.2 Desired URL mapping

In the example shown in table B.3.2‑1 below, the following apply:

1. Media resources for the Provisioning Session with external identifier com.d2.provider.service are exposed at M4d from a default canonical domain com-d2-provider-service.‌ The URL d2.ms.‌as.‌3gppservices.‌org is determined by the 5GMSd System operator, and a custom domain name alias 5gms.d2.provider.com has also been configured by the 5GMSd Application Provider.
2. Media resources for the Provisioning Session with external identifier com.d1.provider.service are exposed at M10d (and potentially M4d) from a default canonical domain com-d1-provider-service.‌ The URL d1.ms.‌as.‌3gppservices.‌org is determined by the 5GMSd System operator, and a custom domain name alias 5gms.d1.provider.com has also been configured by the 5GMSd Application Provider.

Table B.3.2‑1: Example URL mapping for pull-based ingest

|  |  |  |
| --- | --- | --- |
| M4d request from 5GMSd Client to client-facing 5GMSd AS | Mapped M10d request to origin server-facing 5GMSd AS | Mapped M2d request to origin server on 5GMSd AS cache miss |
| https://**com-d2-provider-service.d2.ms.as.3gppservices.org**/**asset123456**/**video1**/segment1000.mp4 | https://**com-d1-provider-service.d1.ms.as.3gppservices.org**/**asset123456**/**video1**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**video1**/segment1000.mp4 |
| [https://](https://5gms.d2.provider.com/‌asset123456/video1/segment1000.mp4)**[5gms.d2.provider.com](https://5gms.d2.provider.com/‌asset123456/video1/segment1000.mp4)**[/‌](https://5gms.d2.provider.com/‌asset123456/video1/segment1000.mp4)**[asset123456](https://5gms.d2.provider.com/‌asset123456/video1/segment1000.mp4)**[/](https://5gms.d2.provider.com/‌asset123456/video1/segment1000.mp4)**[video1](https://5gms.d2.provider.com/‌asset123456/video1/segment1000.mp4)**[/segment1000.mp4](https://5gms.d2.provider.com/‌asset123456/video1/segment1000.mp4) | [https://](https://5gms.d1.provider.com/‌asset123456/video1/segment1000.mp4)**[5gms.d1.provider.com](https://5gms.d1.provider.com/‌asset123456/video1/segment1000.mp4)**[/‌](https://5gms.d1.provider.com/‌asset123456/video1/segment1000.mp4)**[asset123456](https://5gms.d1.provider.com/‌asset123456/video1/segment1000.mp4)**[/](https://5gms.d1.provider.com/‌asset123456/video1/segment1000.mp4)**[video1](https://5gms.d1.provider.com/‌asset123456/video1/segment1000.mp4)**[/segment1000.mp4](https://5gms.d1.provider.com/‌asset123456/video1/segment1000.mp4) |
| https://**com-d2-provider-service.d2.ms.as.3gppservices.org**/**asset123456**/**video2**/segment1000.mp4 | https://**com-d1-provider-service.d1.ms.as.3gppservices.org**/**asset123456**/**video2**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**video2**/segment1000.mp4 |
| [https://](https://5gms.d2.provider.com/‌asset123456/video2/segment1000.mp4)**[5gms.d2.provider.com](https://5gms.d2.provider.com/‌asset123456/video2/segment1000.mp4)**[/‌](https://5gms.d2.provider.com/‌asset123456/video2/segment1000.mp4)**[asset123456](https://5gms.d2.provider.com/‌asset123456/video2/segment1000.mp4)**[/](https://5gms.d2.provider.com/‌asset123456/video2/segment1000.mp4)**[video2](https://5gms.d2.provider.com/‌asset123456/video2/segment1000.mp4)**[/segment1000.mp4](https://5gms.d2.provider.com/‌asset123456/video2/segment1000.mp4) | [https://](https://5gms.d1.provider.com/‌asset123456/video2/segment1000.mp4)**[5gms.d1.provider.com](https://5gms.d1.provider.com/‌asset123456/video2/segment1000.mp4)**[/‌](https://5gms.d1.provider.com/‌asset123456/video2/segment1000.mp4)**[asset123456](https://5gms.d1.provider.com/‌asset123456/video2/segment1000.mp4)**[/](https://5gms.d1.provider.com/‌asset123456/video2/segment1000.mp4)**[video2](https://5gms.d1.provider.com/‌asset123456/video2/segment1000.mp4)**[/segment1000.mp4](https://5gms.d1.provider.com/‌asset123456/video2/segment1000.mp4) |
| https://**com-d2-provider-service.d2.ms.as.3gppservices.org**/**asset123456**/**audio1**/segment1000.mp4 | https://**com-d1-provider-service.d1.ms.as.3gppservices.org**/**asset123456**/**audio1**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**audio1**/segment1000.mp4 |
| https://**5gms.d2.provider.com**/‌**asset123456**/**audio1**/segment1000.mp4 | https://**5gms.d1.provider.com**/‌**asset123456**/**audio1**/segment1000.mp4 |

## B.3.3 Content Hosting Configurations

Tables B.3.3‑1 and B.3.3-2 below show the relevant parameters for both Content Hosting Configurations needed to achieve the example mapping described in table B.3.2‑1 above.

Table B.1.3‑1: Client-Facing 5GMSd AS Content Hosting Configuration properties relevant to pull-based ingest

|  |  |  |
| --- | --- | --- |
| Property | Example value | Set by |
| IngestConfiguration | | |
| protocol | urn:3gpp:5gms:content-protocol:**http-pull** | 5GMSd Application Provider *(M1d request)* |
| mode | PULL |
| baseURL | https://com-d1-provider-service.d1.ms.as.3gppservices.org |
| https://5gms.d1.provider.com/ |
| DistributionConfiguration | | |
| canonicalDomainName | com-d2-provider-service.d2.ms.as.3gppservices.org | 5GMSd AF *(M1d response)* |
| domainNameAlias | 5gms.d2.provider.com | 5GMSd Application Provider (*M1d request)* |
| baseURL | https:// 5gms.d2.provider.com / | 5GMSd AF *(M1d response)* |

Table B.1.3‑2: Origin Server-Facing 5GMSd AS Content Hosting Configuration properties relevant to pull-based ingest

|  |  |  |
| --- | --- | --- |
| Property | Example value | Set by |
| IngestConfiguration | | |
| protocol | urn:3gpp:5gms:content-protocol:**http-pull** | 5GMSd Application Provider *(M1d request)* |
| mode | PULL |
| baseURL | https://origin.provider.com/‌media |
| DistributionConfiguration | | |
| canonicalDomainName | com-d1-provider-service.d1.ms.as.3gppservices.org | 5GMSd AF *(M1d response)* |
| domainNameAlias | 5gms.d1.provider.com | 5GMSd Application Provider *(M1d request)* |
| baseURL | https:// 5gms.d1.provider.com / | 5GMSd AF *(M1d response)* |

# B.4 Push-based content ingest with 5GMSd AS service chaining via M10d

### B.4.1 Overview

This example shows how to provision multiple Content Hosting Configurations allowing for content hosting service chaining via reference point M10d.

1. The 5GMSd Application Provider uploads content to the origin server-facing 5GMSd AS via M2d.

2. The origin server-facing 5GMSd AS rewrites the M2d upload URL to a M10d downlink URL that is exposed to a client-facing 5GMSd AS.

3. The client-facing 5GMSd AS rewrites the M10d upload URL to a M4d downlink URL that is exposed to the 5GMSd Client on the UE.

## B.4.1 Desired URL mapping

In the example shown in table B.4.2‑1 below, the following apply:

1. Media resources for the Provisioning Session with external identifier com.d1.provider.service are pushed into the origin server-facing 5GMSd AS at M2d by the 5GMSd Application Provider and exposed to the client-facing 5GMSd AS at M10d using the canonical name of the origin server-facing 5GMSd AS com-d1-provider-service.‌ms.‌as.‌3gppservices.org and an additional domain name alias 5gmsd.d1.provider.com configured by the 5GMSd Application Provider.
2. Media resources for the Provisioning Session with external identifier com.d2.provider.service are pushed into the client-facing 5GMSd AS at M10d by the origin server-facing 5GMSd AS and exposed to the 5GMSd Client at M4d using the canonical name of the client-facing 5GMSd AS com-d2-provider-service.‌ms.‌as.‌3gppservices.org and an additional domain name alias 5gmsd.d2.provider.com configured by the 5GMSd Application Provider.

Table B.4.1‑1: Example URL mapping for push-based ingest

|  |  |  |
| --- | --- | --- |
| M2d ingest URL pushed to origin server-facing 5GMSd AS | M10d URL pushed to client-facing 5GMSd AS | M4d URL exposed to 5GMSd Client |
| [https://5gmsd-as.d1.mno.net/com-provider-service/](https://5gmsd-as.d1.mno.net/com-provider-service/asset123456/)**[asset123456](https://5gmsd-as.d1.mno.net/com-provider-service/asset123456/)**[/](https://5gmsd-as.d1.mno.net/com-provider-service/asset123456/)  **video1**/segment1000.mp4 | https://**com-d1-provider-service.ms.as.3gppservices.org**/‌**asset123456**/**video1**/segment1000.mp4 | https://**com-d2-provider-service.ms.as.3gppservices.org**/‌**asset123456**/**video1**/segment1000.mp4 |
| https://**5gms.d1.provider.com**/‌**asset123456**/**video1**/segment1000.mp4 | https://**5gms.d2.provider.com**/‌**asset123456**/**video1**/segment1000.mp4 |
| https://5gmsd-as.mno.net/com-provider-service/‌**asset123456**/**video2**/segment1000.mp4 | https://**com-d1-provider-service.ms.as.3gppservices.org**/‌**asset123456**/**video2**/segment1000.mp4 | https://**com-d2-provider-service.ms.as.3gppservices.org**/‌**asset123456**/**video2**/segment1000.mp4 |
| https://**5gms.d1.provider.com**/‌**asset123456**/**video2**/segment1000.mp4 | https://**5gms.d2.provider.com**/‌**asset123456**/**video2**/segment1000.mp4 |
| https://5gmsd-as.mno.net/com-provider-service/‌**asset123456**/**audio1**/segment1000.mp4 | https://**com-d1-provider-service.ms.as.3gppservices.org**/‌**asset123456**/**audio1**/segment1000.mp4 | [https://](https://com-d2-provider-service.ms.as.3gppservices.org/‌asset123456/audio1/segment1000.mp4)**[com-d2-provider-service.ms.as.3gppservices.org](https://com-d2-provider-service.ms.as.3gppservices.org/‌asset123456/audio1/segment1000.mp4)**[/‌](https://com-d2-provider-service.ms.as.3gppservices.org/‌asset123456/audio1/segment1000.mp4)**[asset123456](https://com-d2-provider-service.ms.as.3gppservices.org/‌asset123456/audio1/segment1000.mp4)**[/](https://com-d2-provider-service.ms.as.3gppservices.org/‌asset123456/audio1/segment1000.mp4)**[audio1](https://com-d2-provider-service.ms.as.3gppservices.org/‌asset123456/audio1/segment1000.mp4)**[/segment1000.mp4](https://com-d2-provider-service.ms.as.3gppservices.org/‌asset123456/audio1/segment1000.mp4) |
| https://**5gms.d1.provider.com**/‌**asset123456**/**audio1**/segment1000.mp4 | https://**5gms.d2.provider.com**/‌**asset123456**/**audio1**/segment1000.mp4 |

## B.4.2 Content Hosting Configuration

Tables B.4.2‑1 and B.4.2-2 below show the relevant parameters for both Content Hosting Configurations needed to achieve the example mapping described in table B.4.1‑1 above.

Table B.2.2‑1: Origin server-facing Content Hosting Configuration properties relevant to push-based ingest

|  |  |  |
| --- | --- | --- |
| Property | Example value | Set by |
| IngestConfiguration | | |
| protocol | http://dashif.org/‌ingest/‌v1.2‌/interface-1 | 5GMSd Application Provider *(M1d request)* |
| mode | PUSH |
| baseURL | https://5gmsd-as.mno.net/‌com-provider-service/ | 5GMSd AF *(M1d response)* |
| DistributionConfiguration | | |
| canonicalDomainName | com-d1-provider-service.ms.as.3gppservices.org | 5GMSd AF *(M1d response)* |
| domainNameAlias | 5gms.d1.provider.com | 5GMSd Application Provider *(M1d request)* |
| baseURL | https://5gms.d1.provider.com/ | 5GMSd AF *(M1d response)* |

Table B.2.2‑2: Client-facing Content Hosting Configuration properties relevant to push-based ingest

|  |  |  |
| --- | --- | --- |
| Property | Example value | Set by |
| IngestConfiguration | | |
| protocol | http://dashif.org/‌ingest/‌v1.2‌/interface-1 | 5GMSd Application Provider *(M1d request)* |
| mode | PUSH |
| baseURL | https://5gms.d1.provider.com/ | 5GMSd AF *(M1d response)* |
| DistributionConfiguration | | |
| canonicalDomainName | com-d2-provider-service.ms.as.3gppservices.org | 5GMSd AF *(M1d response)* |
| domainNameAlias | 5gms.d2.provider.com | 5GMSd Application Provider *(M1d request)* |
| baseURL | https://5gms.d2.provider.com/ | 5GMSd AF *(M1d response)* |

# B.5 Pull-based content ingest with CMMF distribution example

### B.5.1 Overview

1. The 5GMSd Client on the UE:

a. Selects a media resource to be downloaded (e.g., from an MPD).

b. Maps the URL of the selected media resource into two CMMF objects available at two different service locations exposed at reference point M4d.

c. Requests both CMMF objects, one from each service location via M4d.

2. The 5GMSd AS determines that it does not have a cached copy of either requested CMMF object or the media resource those objects contains.

3. The 5GMSd AS transforms the M4d request URL into a request for the media resource to the 5GMSd Application Provider’s origin server via M2d.

6. The 5GMSd AS ingests the media resource at reference point M2d, prepares the media resource by encoding and packaging it into two CMMF objects using two different Content Preparation Templates, and responds to the 5GMSd Client from two different service locations via M4d.

7. The 5GMSd Client on the UE decodes the CMMF object(s)

## B.5.1 Desired URL mapping

In the example shown in table B.5.2‑1 below, the following apply:

1. Media resources for the Provisioning Session with external identifier com.provider.service are exposed at M4d from a default canonical domain com-provider-service.‌

2. The URL d1.ms.‌as.‌3gppservices.‌org is determined by the 5GMSd System operator, and a custom domain name alias 5gms.d1.provider.com has also been configured by the 5GMSd Application Provider.

3. The URL d2.ms.‌as.‌3gppservices.‌org is determined by the 5GMSd System operator, and a custom domain name alias 5gms.d2.provider.com has also been configured by the 5GMSd Application Provider.

4. Media resource URLs communicated in the MPD are mapped by the 5GMSd Client to requests on M4d using CMMF configuration information contained within the Media Player Entry (or a document pointed to by the Media Player Entry).

5. The 5GMSd AS transforms the M4d request URL into a request to the 5GMSd Application Provider’s origin server via M2d.

6. The Content Preparation Templates used to encode and package media resources ingested at M2d within CMMF objects have *contentPreparationTemplateIds* cmmf-content-preparation-template-id-1 and cmmf-content-preparation-template-id-2 for distribution configurations described in 2 and 3 above respectively.

Table B.4.1‑1: Example URL mapping for pull-based ingest with CMMF distribution

|  |  |  |
| --- | --- | --- |
| MPD media resource URL | M4d request from 5GMSd Client | Mapped M2d request to origin server on 5GMSd AS cache miss |
| [/](https://5gmsd-as.d1.mno.net/com-provider-service/asset123456/)**[asset123456](https://5gmsd-as.d1.mno.net/com-provider-service/asset123456/)**[/](https://5gmsd-as.d1.mno.net/com-provider-service/asset123456/)**video1**/segment1000.mp4 | https://**com-provider-service.d1.ms.as.3gppservices.org**/**asset123456**/**video1**/**cmmf-a**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**video1**/segment1000.mp4 |
| https://**5gms.d1.provider.com**/‌**asset123456**/**video1**/**cmmf-a**/segment1000.mp4 |
| [https://](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/video1/cmmf-b/segment1000.mp4)**[com-provider-service.d2.ms.as.3gppservices.org](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/video1/cmmf-b/segment1000.mp4)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/video1/cmmf-b/segment1000.mp4)**[asset123456](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/video1/cmmf-b/segment1000.mp4)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/video1/cmmf-b/segment1000.mp4)**[video1](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/video1/cmmf-b/segment1000.mp4)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/video1/cmmf-b/segment1000.mp4)**[cmmf-b](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/video1/cmmf-b/segment1000.mp4)**[/segment1000.mp4](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/video1/cmmf-b/segment1000.mp4) |
| https://**5gms.d2.provider.com**/‌**asset123456**/**video1**/**cmmf-b**/segment1000.mp4 |
| /**asset123456**/**video2**/segment1000.mp4 | https://**com-provider-service.d1.ms.as.3gppservices.org**/**asset123456**/**video2**/**cmmf-a**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**video2**/segment1000.mp4 |
| https://**5gms.d1.provider.com**/‌**asset123456**/**video2**/**cmmf-a**/segment1000.mp4 |
| https://**com-provider-service.d2.ms.as.3gppservices.org**/**asset123456**/**video2**/**cmmf-b**/segment1000.mp4 |
| https://**5gms.d2.provider.com**/‌**asset123456**/**video2**/**cmmf-b*/***segment1000.mp4 |
| /**asset123456**/**audio1**/segment1000.mp4 | https://**com-provider-service.d1.ms.as.3gppservices.org**/**asset123456**/**audio1**/**cmmf-a**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**audio1**/segment1000.mp4 |
| https://**5gms.d1.provider.com**/‌**asset123456**/**audio1**/**cmmf-a**/segment1000.mp4 |
| [https://](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/audio1/cmmf-b/segment1000.mp4)**[com-provider-service.d2.ms.as.3gppservices.org](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/audio1/cmmf-b/segment1000.mp4)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/audio1/cmmf-b/segment1000.mp4)**[asset123456](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/audio1/cmmf-b/segment1000.mp4)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/audio1/cmmf-b/segment1000.mp4)**[audio1](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/audio1/cmmf-b/segment1000.mp4)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/audio1/cmmf-b/segment1000.mp4)**[cmmf-b](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/audio1/cmmf-b/segment1000.mp4)**[/segment1000.mp4](https://com-provider-service.d2.ms.as.3gppservices.org/asset123456/audio1/cmmf-b/segment1000.mp4) |
| https://**5gms.d2.provider.com**/‌**asset123456**/**audio1**/**cmmf-b**/segment1000.mp4 |

## B.5.2 Content Hosting Configuration

Table B.5.2‑1 below shows the relevant parameters for the Content Hosting Configuration needed to achieve the example mapping described in table B.5.1‑1 above.

Table B.5.2‑1: Content Hosting Configuration properties relevant to pull-based ingest with CMMF distribution

|  |  |  |
| --- | --- | --- |
| Property | Example value | Set by |
| IngestConfiguration | | |
| protocol | urn:3gpp:5gms:content-protocol:**http-pull** | 5GMSd Application Provider *(M1d request)* |
| mode | PULL |
| baseURL | https://origin.provider.com/media |
| DistributionConfiguration | | |
| *affinityGroup* | Distribution-A | 5GMSd Application Provider *(M1d request)* |
| *contentPreparation‌TemplateId* | cmmf-content-preparation-template-id-1 |
| canonicalDomainName | com-provider-service.d1.ms.as.3gppservices.org | 5GMSd AF *(M1d response)* |
| domainNameAlias | 5gms.d1.provider.com | 5GMSd Application Provider *(M1d request)* |
| baseURL | https://5gms.d1.provider.com/ | 5GMSd AF *(M1d response)* |
| *pathRewriteRule* | | |
| *requestPathPattern* | “cmmf-a/$” | 5GMSd Application Provider *(M1d request)* |
| *mappedPath* | “” |
| *DistributionConfiguration* | | |
| *affinityGroup* | Distribution-B | 5GMSd Application Provider *(M1d request)* |
| *contentPreparation‌TemplateId* | cmmf-content-preparation-template-id-2 |
| *canonicalDomainName* | com-provider-service.d2.ms.as.3gppservices.org | 5GMSd AF *(M1d response)* |
| *domainNameAlias* | 5gms.d2.provider.com | 5GMSd Application Provider *(M1d request)* |
| *baseURL* | https://5gms.d2.provider.com/ | 5GMSd AF *(M1d response)* |
| *pathRewriteRule* | | |
| *requestPathPattern* | “cmmf-b/$” | 5GMSd Application Provider *(M1d request)* |
| *mappedPath* | “” |

# B.6 Push-based content ingest with CMMF distribution example

### B.6.1 Overview

1. The 5GMSd Application Provider uploads the media resource to the 5GMSd AS via M2d.

2. The 5GMSd AS prepares the M2d upload by encoding and packaging it into two CMMF objects that are exposed by different service locations at M4d to the 5GMSd Client on the UE.

3. The 5GMSd Client on the UE:

a. Selects a media resource to be downloaded (e.g., from an MPD).

b. Maps the URL of the selected media resource into two CMMF objects available at two different service locations exposed at reference point M4d.

c. Requests both CMMF objects, one from each service location via M4d.

d. Decodes the CMMF object(s)

## B.6.1 Desired URL mapping

In the example shown in table B.6.2‑1 below, the following apply:

1. Media resources for the Provisioning Session with external identifier com.provider.service are pushed into the 5GMSd AS at M2d by the 5GMSd Application Provider.

2. The URL com-provider-service.d1.ms.‌as.‌3gppservices.‌org and an additional domain name alias 5gmsd.d1.provider.com configured by the 5GMSd Application Provider.

3. The URL com-provider-service.d2.ms.‌as.‌3gppservices.‌org and an additional domain name alias 5gmsd.d2.provider.com configured by the 5GMSd Application Provider.

4. Media resource URLs communicated in the MPD are mapped by the 5GMSd Client to requests on M4d using CMMF configuration information contained within the Media Player Entry (or a document pointed to by the Media Player Entry).

5. The Content Preparation Templates used to encode and package media resources ingested at M2d within CMMF objects have *contentPreparationTemplateIds* cmmf-content-preparation-template-id-1 and cmmf-content-preparation-template-id-2 for distribution configurations described in 2 and 3 above respectively.

Table B.6.1‑1: Example URL mapping for push-based ingest with CMMF distribution

|  |  |  |
| --- | --- | --- |
| M2d ingest URL pushed to 5GMSd AS | M4d URL exposed to 5GMSd Client | MPD media resource URL |
| https://5gmsd-as.mno.net/com-provider-service/‌**asset123456**/**video1**/segment1000.mp4 | [https://](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video1/cmmf-a/)**[com-provider-service.d1.ms.as.3gppservices.org](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video1/cmmf-a/)**[/‌](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video1/cmmf-a/)**[asset123456](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video1/cmmf-a/)**[/](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video1/cmmf-a/)**[video1](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video1/cmmf-a/)**[/](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video1/cmmf-a/)**[cmmf-a](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video1/cmmf-a/)**[/](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video1/cmmf-a/)  segment1000.mp4 | /**asset123456**/**video1**/  segment1000.mp4 |
| [https://](https://5gms.d1.provider.com/‌asset123456/video1/cmmf-a/)**[5gms.d1.provider.com](https://5gms.d1.provider.com/‌asset123456/video1/cmmf-a/)**[/‌](https://5gms.d1.provider.com/‌asset123456/video1/cmmf-a/)**[asset123456](https://5gms.d1.provider.com/‌asset123456/video1/cmmf-a/)**[/](https://5gms.d1.provider.com/‌asset123456/video1/cmmf-a/)**[video1](https://5gms.d1.provider.com/‌asset123456/video1/cmmf-a/)**[/](https://5gms.d1.provider.com/‌asset123456/video1/cmmf-a/)**[cmmf-a](https://5gms.d1.provider.com/‌asset123456/video1/cmmf-a/)**[/](https://5gms.d1.provider.com/‌asset123456/video1/cmmf-a/)  segment1000.mp4 |
| [https://](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video1/cmmf-b/)**[com-provider-service.d2.ms.as.3gppservices.org](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video1/cmmf-b/)**[/‌](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video1/cmmf-b/)**[asset123456](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video1/cmmf-b/)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video1/cmmf-b/)**[video1](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video1/cmmf-b/)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video1/cmmf-b/)**[cmmf-b](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video1/cmmf-b/)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video1/cmmf-b/)  segment1000.mp4 |
| [https://](https://5gms.d2.provider.com/‌asset123456/video1/cmmf-b/)**[5gms.d2.provider.com](https://5gms.d2.provider.com/‌asset123456/video1/cmmf-b/)**[/‌](https://5gms.d2.provider.com/‌asset123456/video1/cmmf-b/)**[asset123456](https://5gms.d2.provider.com/‌asset123456/video1/cmmf-b/)**[/](https://5gms.d2.provider.com/‌asset123456/video1/cmmf-b/)**[video1](https://5gms.d2.provider.com/‌asset123456/video1/cmmf-b/)**[/](https://5gms.d2.provider.com/‌asset123456/video1/cmmf-b/)**[cmmf-b](https://5gms.d2.provider.com/‌asset123456/video1/cmmf-b/)**[/](https://5gms.d2.provider.com/‌asset123456/video1/cmmf-b/)  segment1000.mp4 |
| https://5gmsd-as.mno.net/com-provider-service/‌**asset123456**/**video2**/segment1000.mp4 | [https://](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video2/cmmf-a/)**[com-provider-service.d1.ms.as.3gppservices.org](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video2/cmmf-a/)**[/‌](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video2/cmmf-a/)**[asset123456](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video2/cmmf-a/)**[/](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video2/cmmf-a/)**[video2](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video2/cmmf-a/)**[/](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video2/cmmf-a/)**[cmmf-a](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video2/cmmf-a/)**[/](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/video2/cmmf-a/)  segment1000.mp4 | ‌**asset123456**/**video2**/  segment1000.mp4 |
| [https://](https://5gms.d1.provider.com/‌asset123456/video2/cmmf-a/)**[5gms.d1.provider.com](https://5gms.d1.provider.com/‌asset123456/video2/cmmf-a/)**[/‌](https://5gms.d1.provider.com/‌asset123456/video2/cmmf-a/)**[asset123456](https://5gms.d1.provider.com/‌asset123456/video2/cmmf-a/)**[/](https://5gms.d1.provider.com/‌asset123456/video2/cmmf-a/)**[video2](https://5gms.d1.provider.com/‌asset123456/video2/cmmf-a/)**[/](https://5gms.d1.provider.com/‌asset123456/video2/cmmf-a/)**[cmmf-a](https://5gms.d1.provider.com/‌asset123456/video2/cmmf-a/)**[/](https://5gms.d1.provider.com/‌asset123456/video2/cmmf-a/)  segment1000.mp4 |
| [https://](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video2/cmmf-b/)**[com-provider-service.d2.ms.as.3gppservices.org](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video2/cmmf-b/)**[/‌](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video2/cmmf-b/)**[asset123456](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video2/cmmf-b/)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video2/cmmf-b/)**[video2](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video2/cmmf-b/)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video2/cmmf-b/)**[cmmf-b](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video2/cmmf-b/)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/video2/cmmf-b/)  segment1000.mp4 |
| [https://](https://5gms.d2.provider.com/‌asset123456/video2/cmmf-b/)**[5gms.d2.provider.com](https://5gms.d2.provider.com/‌asset123456/video2/cmmf-b/)**[/‌](https://5gms.d2.provider.com/‌asset123456/video2/cmmf-b/)**[asset123456](https://5gms.d2.provider.com/‌asset123456/video2/cmmf-b/)**[/](https://5gms.d2.provider.com/‌asset123456/video2/cmmf-b/)**[video2](https://5gms.d2.provider.com/‌asset123456/video2/cmmf-b/)**[/](https://5gms.d2.provider.com/‌asset123456/video2/cmmf-b/)**[cmmf-b](https://5gms.d2.provider.com/‌asset123456/video2/cmmf-b/)**[/](https://5gms.d2.provider.com/‌asset123456/video2/cmmf-b/)  segment1000.mp4 |
| https://5gmsd-as.mno.net/com-provider-service/‌**asset123456**/**audio1**/segment1000.mp4 | [https://](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-a/)**[com-provider-service.d1.ms.as.3gppservices.org](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-a/)**[/‌](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-a/)**[asset123456](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-a/)**[/](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-a/)**[audio1](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-a/)**[/](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-a/)**[cmmf-a](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-a/)**[/](https://com-provider-service.d1.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-a/)  segment1000.mp4 | /‌**asset123456**/**audio1**/  segment1000.mp4 |
| [https://](https://5gms.d1.provider.com/‌asset123456/audio1/cmmf-a/)**[5gms.d1.provider.com](https://5gms.d1.provider.com/‌asset123456/audio1/cmmf-a/)**[/‌](https://5gms.d1.provider.com/‌asset123456/audio1/cmmf-a/)**[asset123456](https://5gms.d1.provider.com/‌asset123456/audio1/cmmf-a/)**[/](https://5gms.d1.provider.com/‌asset123456/audio1/cmmf-a/)**[audio1](https://5gms.d1.provider.com/‌asset123456/audio1/cmmf-a/)**[/](https://5gms.d1.provider.com/‌asset123456/audio1/cmmf-a/)**[cmmf-a](https://5gms.d1.provider.com/‌asset123456/audio1/cmmf-a/)**[/](https://5gms.d1.provider.com/‌asset123456/audio1/cmmf-a/)  segment1000.mp4 |
| [https://](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-b/)**[com-provider-service.d2.ms.as.3gppservices.org](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-b/)**[/‌](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-b/)**[asset123456](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-b/)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-b/)**[audio1](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-b/)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-b/)**[cmmf-b](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-b/)**[/](https://com-provider-service.d2.ms.as.3gppservices.org/‌asset123456/audio1/cmmf-b/)  segment1000.mp4 |
| [https://](https://5gms.d2.provider.com/‌asset123456/audio1/cmmf-b/)**[5gms.d2.provider.com](https://5gms.d2.provider.com/‌asset123456/audio1/cmmf-b/)**[/‌](https://5gms.d2.provider.com/‌asset123456/audio1/cmmf-b/)**[asset123456](https://5gms.d2.provider.com/‌asset123456/audio1/cmmf-b/)**[/](https://5gms.d2.provider.com/‌asset123456/audio1/cmmf-b/)**[audio1](https://5gms.d2.provider.com/‌asset123456/audio1/cmmf-b/)**[/](https://5gms.d2.provider.com/‌asset123456/audio1/cmmf-b/)**[cmmf-b](https://5gms.d2.provider.com/‌asset123456/audio1/cmmf-b/)**[/](https://5gms.d2.provider.com/‌asset123456/audio1/cmmf-b/)  segment1000.mp4 |

## B.6.2 Content Hosting Configuration

Table B.6.2‑1 below shows the relevant parameters for the Content Hosting Configuration needed to achieve the example mapping described in table B.6.1‑1 above.

Table B.6.2‑1: Content Hosting Configuration properties relevant to push-based ingest with CMMF distribution

|  |  |  |
| --- | --- | --- |
| Property | Example value | Set by |
| IngestConfiguration | | |
| protocol | http://dashif.org/‌ingest/‌v1.2‌/interface-1 | 5GMSd Application Provider  *(M1d request)* |
| mode | PUSH |
| baseURL | https://origin.provider.com/media | 5GMSd AF *(M1d response)* |
| DistributionConfiguration | | |
| *affinityGroup* | Distribution-A | 5GMSd Application Provider *(M1d request)* |
| *contentPreparation*  *TemplateId* | cmmf-content-preparation-template-id-1 |
| canonicalDomainName | com-provider-service.d1.ms.as.3gppservices.org | 5GMSd AF *(M1d response)* |
| domainNameAlias | 5gms.d1.provider.com | 5GMSd Application Provider *(M1d request)* |
| baseURL | https://5gms.d1.provider.com/ | 5GMSd AF *(M1d response)* |
| *pathRewriteRule* | | |
| *requestPathPattern* | “cmmf-a/$” | 5GMSd Application Provider *(M1d request)* |
| *mappedPath* | “” |
| *DistributionConfiguration* | | |
| *affinityGroup* | Distribution-B | 5GMSd Application Provider *(M1d request)* |
| *contentPreparation*  *TemplateId* | cmmf-content-preparation-template-id-2 |
| *canonicalDomainName* | com-provider-service.d2.ms.as.3gppservices.org | 5GMSd AF *(M1d response)* |
| *domainNameAlias* | 5gms.d2.provider.com | 5GMSd Application Provider *(M1d request)* |
| *baseURL* | https://5gms.d2.provider.com/ | 5GMSd AF *(M1d response)* |
| *pathRewriteRule* | | |
| *requestPathPattern* | “cmmf-b/$” | 5GMSd Application Provider *(M1d request)* |
| *mappedPath* | “” |

## ===== CHANGE =====

Annex H (informative):  
Media Entry Point examples

# H.1 Overview

This annex provides examples of different Media Entry Point document constructions.

# H.2 Media Player Entry examples (downlink)

### H.2.1 DASH Media Presentation Description (MPD) examples

Annex D of TS 26.247 [4] provides numerous examples of MPD documents.

### H.2.2 CMMF downlink streaming media configuration example

The example shown in table H.2.2-1 illustrates a JSON-formatted Media Player Entry that augments an existing MPD or URL to a media file with CMMF configuration information. It is assumed that the 5GMSd Client is capable of interpreting and acting upon this Media Player Entry.

Editor’s Note: The table below provides a schema that should be defined elsewhere. This table will be moved to a more appropriate place and replaced with an example in a future CR revision. It may also make sense to convert this into an XML schema and example.

Table H.2.2-1: CMMF downlink streaming media configuration example

|  |
| --- |
| {  “mediaResourceUrl”: string, // REQUIRED. URL of an MPD for DASH  // sessions or media file for  // progressive download sessions.  “downlinkConfiguration”: [  {  “mediaResourcePathPattern”: string, // OPTIONAL. A regular expression  // against which the path of the media  // resource URL shall be compared. If  // true, this downlink  // configuration applies.  “serviceLocation”: [  {  “baseURL”: string, // OPTIONAL. Base URL of the service  // location exposed by the 5GMSd AS.  // Base URLs defined here overwrite the  // base URLs of the media resource  // request (if they exist).  “requestPathPattern”: string, // OPTIONAL. A regular expression  // against which the path of the media  // resource URL shall be compared,  // including the leading “/”, and up to  // and including the final “/” shall be  // compared. (Any leaf path element  // following the final “/” shall be  // excluded from this comparison.)  “mappedPath”: string, // OPTIONAL. A replacement for the  // portion of the media resource path  // that matches the requestPathPattern.  },  ],  “cmmfConfiguration”: {  “cmmfVersion”: number, // REQUIRED if CMMF in use. Version of  // the CMMF specification in use.  “cmmfCodeType”: number, // OPTIONAL. The CMMF code\_type used  // (see clause 6.1.4.11 of ETSI TS 103  // 973 [68]). Note: The cmmfCodeType is  // provided within the  // bitstream\_header() subatom of the  // CMMF object distributed on M4d.  “cmmfProfile”: string, // OPTIONAL. The CMMF profile\_type (see  // clause 6.1.4.11 of ETSI TS 103 973  // [68]). Note: the cmmfProfile is  // provided within the  // bitstream\_header() subatom of the  // CMMF object distributed on M4d.  “cmmfProfileDescription”: string, // OPTIONAL. The CMMF  // profile\_description (see clause  // 6.1.4.12 of ETSI TS 103 973 [68]).  // Note: The cmmfProfileDescription is  // provided within the  // bitstream\_header() subatom of the  // CMMF object distributed on M4d.  },  },  ],  } |

### H.2.3 CMMF EFDT downlink streaming media configuration example

This example uses the EFDT as defined in clause D.2.3.1 of ETSI TS 103 973 [68].

Editor’s Note: An example is yet to be defined.

# H.3 Media Streamer Entry examples (uplink)

To be determined.