**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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|  |
| ***Title:***  |  |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***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 canbe 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:*** | Satisfy the objectives of Work Task 2 “Media delivery from multiple service endpoints/locations” as documented in S4-250411. |
|  |  |
| ***Summary of change:*** | Required technology-independent feature updates to enable media delivery from multiple service locations and service chaining of the Media AS.  |
|  |  |
| ***Consequences if not approved:*** | Objectives of the Work Item not completely satisfied. |
|  |  |
| ***Clauses affected:*** | 4.2, 4.3.1, 4.3.4.1, 4.3.5.1, 4.3.6.1, 4.6.3 (new), 4.7.2.1, 4.10A (new), 4.10B (new), 5.1, 5.2, 6.0.2.2, 6.2.1.2, 7.4.1, 7.6.1, 7.6.4.1, 7.6.4.2, 7.6.4.3, 7.6.4.4, 7.6.4.5, 7.6.4.7 (new), 7.6.4.8 (new), 7.6A.1, 8, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 10.2, 10.3, 10.3A (new), 10.4.1, 10.4.2, 10.4.3 (new), 11.3.3.1, 13.2.1, B.1.2, B.1.3, B.2.1, B.2.2, B.3 (new), B.4 (new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 26.501 CR 0111TS 26.510 CR 0016 and 0033,TS 26.512 CR 0098 and 0091 |
| ***affected:*** |  | **X** |  Test specifications |   |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |   |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | S4-250696: New CR. Noted.S4-250951: Refactored to incorporate comments from BBC and Qualcomm.S4-251107: Updates to capture comments and changes from BBC.S4-251274: Revised to reflect changes made to version 18.6.0 of TS 26.512S4-251506: Updates to capture comments and changes from BBC and Qualcomm. Addition of code changes to the OpenAPI YAMLs.S4al250127: Minor editorial updates. |

# Code changes

The code changes associated with this Change Request are available for review at the following URL on 3GPP Forge:

<https://forge.3gpp.org/rep/sa4/amd-pro-med/-/merge_requests/5>

<https://forge.3gpp.org/rep/sa4/amd-pro-med/-/merge_requests/5/diffs?commit_id=a3dca77fb7b8f84055d5487b93ce8323be0998ed>

The proposed changes are reproduced below for posterity.

## TS26512\_Mas\_Configuration\_ContentHosting.yaml

---a/TS26512\_Mas\_Configuration\_ContentHosting.yaml
+++b/TS26512\_Mas\_Configuration\_ContentHosting.yaml

@@ -1,7 +1,7 @@

1 1 openapi: 3.0.0

2 2 info:

3 3 title: Mas\_Configuration\_ContentHosting

4 - version: 1.0.2

 4 + version: 1.1.0

5 5 description: |

6 6 5GMS AS Configuration API: Content Hosting

7 7 © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

@@ -12,7 +12,7 @@ tags:

12 12 description: '5G Media Streaming: Application Server Configuration (M3) APIs: Content Hosting'

13 13

14 14 externalDocs:

15 - description: 'TS 26.512 V18.6.0; 5G Media Streaming (5GMS); Protocols'

 15 + description: 'TS 26.512 V19.0.0; 5G Media Streaming (5GMS); Protocols'

16 16 url: 'https://www.3gpp.org/ftp/Specs/archive/26\_series/26.512/'

17 17

18 18 servers:

@@ -335,16 +335,10 @@ components:

335 335 allOf:

336 336 - $ref: 'TS26510\_Maf\_Provisioning\_ContentHosting.yaml#/components/schemas/BaseDistributionConfiguration'

337 337 - type: object

338 - required:

339 - - canonicalDomainName

340 - - baseURL

341 338 properties:

342 339 canonicalDomainName:

343 340 type: string

344 - description: 'Default Fully-Qualified Domain Name assigned by the Media AF for use at reference point M4.'

345 - baseURL:

346 - allOf:

347 - - $ref: 'TS26510\_CommonData.yaml#/components/schemas/AbsoluteUrl'

 341 + description: 'Default Fully-Qualified Domain Name assigned by the Media AF for use at reference point M4 and M10.'

348 342

349 343 # Schema for the resource itself

350 344 ApplicationServerContentHostingConfiguration:

## TS26512\_Mas\_Configuration\_ContentPublishing.yaml

---a/TS26512\_Mas\_Configuration\_ContentPublishing.yaml
+++b/TS26512\_Mas\_Configuration\_ContentPublishing.yaml

@@ -1,7 +1,7 @@

1 1 openapi: 3.0.0

2 2 info:

3 3 title: Mas\_Configuration\_ContentPublishing

4 - version: 1.0.2

 4 + version: 1.1.0

5 5 description: |

6 6 5GMS AS Configuration API: Content Publishing

7 7 © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

@@ -12,7 +12,7 @@ tags:

12 12 description: '5G Media Streaming: Application Server Configuration (M3) APIs: Content Publishing'

13 13

14 14 externalDocs:

15 - description: 'TS 26.512 V18.6.0; 5G Media Streaming (5GMS); Protocols'

 15 + description: 'TS 26.512 V19.0.0; 5G Media Streaming (5GMS); Protocols'

16 16 url: 'https://www.3gpp.org/ftp/Specs/archive/26\_series/26.512/'

17 17

18 18 servers:

@@ -334,17 +334,6 @@ components:

334 334 description: 'A content contribution configuration used to configure a Media AS.'

335 335 allOf:

336 336 - $ref: 'TS26510\_Maf\_Provisioning\_ContentPublishing.yaml#/components/schemas/BaseContributionConfiguration'

337 - - type: object

338 - required:

339 - - canonicalDomainName

340 - - baseURL

341 - properties:

342 - canonicalDomainName:

343 - type: string

344 - description: 'Default Fully-Qualified Domain Name assigned by the Media AF for use at reference point M4.'

345 - baseURL:

346 - allOf:

347 - - $ref: 'TS26510\_CommonData.yaml#/components/schemas/AbsoluteUrl'

348 337

349 338 # Schema for the resource itself

350 339 ApplicationServerContentPublishingConfiguration:

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

## 3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1], TS 26.501 [2] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1] or TS 26.501 [2].

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

## 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 |
| HTTP low-latency pull-based content ingest protocol | 8.4 |
| 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 | 10.2 |
| HTTP low-latency content distribution | 10.3 |
| 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 |
| HTTP low-latency pull-based content ingest protocol | 8.4 |
| 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 M10d, 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 or M10u. 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.

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

### 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 at reference point M4u before passing it to the 5GMSu Application Provider on the egest interface at reference point M2u or to another 5GMSu AS at reference point M10u.

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.

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

### 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.

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 a downlink media streaming session, as specified in clause 10.3A.2.

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 10.3A.4.

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

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## 4.7 Procedures of the M5 (Media Session Handling) interface

### 4.7.1 Introduction

The procedures at reference point M5 are used by a Media Session Handler within a 5GMS Client to invoke services relating to downlink or uplink media streaming on the 5GMS AF.

### 4.7.2 Procedures for Service Access Information

#### 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*. Examples include:

- A URL to a DASH MPD,

- A URL to a document that provides additional details for different streaming session configurations and/or that references or includes 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).

Based on the MIME media type or protocol, as well as the conformance profiles declared in the Service Access Information, one of these Media Entry Points 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.

NOTE: The Media Session Handler and 5GMS-Aware Application are assumed to have prior knowledge of the types of Media Entry Point supported by the Media Player.

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.

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

## 4.10A Procedures of the M10d interface

The procedures at reference point M10d are used by a 5GMSd AS to ingest content from a 5GMSd AS in another 5GMS System. The procedures at this reference point are referred to as *service chaining*.

The following 5GMS AS service chaining protocols specified by the present document may be used 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.

- A *HTTP low-latency pull-based content ingest protocol* is specified in clause 8.4.

## 4.10B Procedures of the M13d interface

No specific procedures are defined at reference point M13d, but it is expected that the Media Player follows similar procedures when interacting with the 5GMSd Application Provider as those defined between the Media Player and the 5GMSd AS at reference point M4d, as outlined in clause 4.6.

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

# 5 Procedures for Uplink Media streaming

## 5.1 General

Uplink media streaming functional entities in the 5GMS System include the 5GMSu Application Provider, 5GMSu AF, 5GMSu AS and the UE. To make use of these other entities, the UE includes a 5GMSu-Aware Application that is provided by the 5GMSu Application Provider and a 5GMSu Client comprising the Media Session Handler and the Media Streamer.

The M1 Provisioning API enables the 5GMSu Application Provider to establish and manage the uplink media session handling and streaming options of the 5GMSu System.

The content egest interface enables uplink media streaming content that has been sent by the 5GMSu Client to the 5GMSu AS at reference point M4u to be subsequently delivered to the 5GMSu Application Provider via reference point M2u or to another 5GMSu AS via reference point M10u. Uplink media streaming media transfer from the 5GMSu AS to the 5GMSu Application Provider at reference point M2u or from one 5GMSu AS to another at reference point M10u may be either pull-based and initiated by the 5GMSu Application Provider using the HTTP GET method, or push-based and initiated by the 5GMSu AS using the HTTP PUT method. The 5GMSu Application Provider's target endpoint for push-based streaming content delivery at reference point M2u is provided to the 5GMSu AF as part of the M1 Provisioning Session and this is passed to the 5GMSu AS as part of the M3u configuration procedures.

The 5GMSu AF, having been successfully provisioned at reference point M1u, sets up corresponding resources at a reference point M5u endpoint from which Service Access Information for uplink media streaming session management, metrics reporting, network assistance and request for policy and/or charging treatment may be retrieved using its provisioned external application identifier. Certain types of configuration and policy information accessed over reference point M5u by the Media Session Handler, such as uplink metrics reporting, QoS policy, or support for AF-based network assistance are further passed to the Media Streamer via the M7u API.

The 5GMSu-Aware Application initiates a new uplink media streaming session by launching the Media Stream Handler at reference point M6u using a 3GPP Service URL for 5GMS (see clause 4.8.3). The 3GPP Service URL indicates the external application identifier. This may be used to retrieve Service Access Information from the 5GMSu AF at reference point M5. Alternatively, if the 5GMSu-Aware Application has already acquired all necessary Service Access Information via private means at reference point M8, this may be supplied directly to the Media Session Handler at reference point M6u as additional parameters.

Based on a request from the 5GMSu-Aware Application or from the Media Streamer received over the M6u API, and based on the Service Access Information acquired from the 5GMSu AF via reference point M5u, the Media Session Handler sets up an uplink media streaming session with a unique media delivery session identifier. Upon successful session establishment, the Media Session Handler triggers the Media Streamer to begin uplink media streaming of media content to the 5GMSu AS over reference point M4u.

Subscription to status and other event notification services is offered by the Media Session Handler to the 5GMSu-Aware Application and to the Media Streamer via the UE media session handling APIs exposed by the Media Session Handler at reference point M6u.

Subscription to status and other event notification services is also offered by the Media Streamer to the 5GMSu-Aware Application and to the Media Session Handler via the UE media stream handling APIs exposed by the Media Player at reference point M11u.

## 5.2 APIs relevant to Uplink Media Streaming

Table 5.2‑1 summarises the APIs used to provision and use the various uplink media streaming features specified in TS 26.501 [2].

Table 5.2‑1: Summary of APIs relevant to uplink media streaming features

|  |  |  |
| --- | --- | --- |
| 5GMSu feature | Abstract | Relevant APIs |
| Interface | API name | Clause |
| Content protocols discovery | Used by the 5GMSu Application Provider to query which content egest protocols are supported by 5GMSu AS(s). | M1u | Content Protocols Discovery API | 7.5 |
| Content publishing | Content is contributed to the 5GMSu AS and published to 5GMSu Application Providers according to a Content Publishing Configuration associated with a Provisioning Session. | M1u | Provisioning Sessions API | 7.2 |
| Server Certificates Provisioning API | 7.3 |
| Content Preparation Templates Provisioning API | 7.4 |
| Content Publication Provisioning API | 7.6A |
| M2u | HTTP pull-based content egest protocol | 8.5 |
| DASH-IF push-based content egest protocol | 8.6 |
| HTTP low-latency pull-based content egest protocol | 8.7 |
| M3u | Server Certificates configuration API | 9.2 |
| Content Preparation Templates configuration API | 9.3 |
| Content Publication configuration API | 9.5 |
| M4u | DASH-IF push-based contribution protocol | 10.4.2 |
| M5u | Service Access Information API | 11.2 |
| M10u | HTTP pull-based content egest protocol | 8.5 |
| DASH-IF push-based content egest protocol | 8.6 |
| HTTP low-latency pull-based content egest protocol | 8.7 |
| Metrics reporting | The 5GMSu Client uploads metrics reports to the 5GMSu AF according to a provisioned Metrics Reporting Configuration it obtains from the Service Access Information for its Provisioning Session. | M1u | Provisioning Sessions API | 7.2 |
| Metrics Reporting Provisioning API | 7.8 |
| M5u | Service Access Information API | 11.2 |
| Metrics Reporting API | 11.4 |
| Dynamic Policy invocation | The 5GMSu Client activates different traffic treatment policies selected from a set of Policy Templates configured in its Provisioning Session. | M1u | Provisioning Sessions API | 7.2 |
| Policy Templates Provisioning API | 7.9 |
| M5u | Service Access Information API | 11.2 |
| Dynamic Policies API | 11.5 |
| Network Assistance | The 5GMSu Client requests bit rate recommendations and delivery boosts from the 5GMSu AF. | M5u | Service Access Information API | 11.2 |
| Network Assistance API | 11.6 |
| Edge content processing | Edge resources are provisioned for processing content in 5GMS uplink media streaming sessions. | M1u | Provisioning Sessions API | 7.2 |
| Edge Resources Provisioning API | 7.10 |
| M5u | Service Access Information API | 11.2 |
| UE data collection, reporting and exposure | UE data related to uplink 5G Media Streaming is reported to the Data Collection AF instantiated in the 5GMSu AF for exposure to Event consumers. | M1u | Event Data processing Provisioning API | 7.11 |
| R4 | Ndcaf\_DataReporting service | 17 |
| R5, R6 | Naf\_EventExposure service | 18 |

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

#### 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 service locations with the following canonical domain name respectively:

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

or

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

where:

- {modifiedDistributionId} is a modified form of the DistributionConfiguration.distributionId property assigned by the 5GMS Application Provider upon provisioning of a Content Hosting Configuration (see clause 5.2.8.2 of TS 26.510 [56]).

*-* {modifiedContributionId} is a modified form of the ContributionConfiguration.contributionId property assigned by the 5GMS Application Provider upon provisioning of a Content Publishing Configuration (see clause 5.2.9.2 of TS 26.510 [56]).

- {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 5.2.2.1 of TS 26.510 [56]).

In all of the above identifiers, every period character ('.') is replaced with a single hyphen character ('-').

For example, the canonical 5GMS AS domain name for a Content Hosting Configuration with a distribution configuration assigned a distributionId property value of distributionA.service or Content Publishing Configuration with a contribution configuration assigned a contributionId property value of contributionA.service created under the Provisioning Session with external service identifier com.provider.service is respectively:

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

or

contributionA-service.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 service location(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 service locations 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.

## ===== HTTP protocol version =====

#### 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] or HTTP/3 [60] endpoints at these reference points. For each protocol version, 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 M2d.

- The 5GMSd AS may use any supported HTTP protocol version to push content at reference point M10d.

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.

## ===== 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 reference point M4d, or to uplink media resources contributed at reference point M4u or M10u for egest at reference point 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 caching, purging and content preparation behaviours for content ingested at reference point M2d or M10d. The Content Hosting Configuration may further specify, through the declaration of affinity groups 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 and 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 transport resources when they are distributed by the 5GMSd AS from reference point M4d service locations. The 5GMSd AS shall use the DistributionConfiguration.‌CachingConfiguration s[ ]‌.urlPatternFilter property 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 transport resource . In the case where a distribution configuration has multiple caching configurations and a transport resource’s URL matches the pattern filter of more than one, the first match shall apply. In case no caching configuration 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. In the absence of these, the 5GMSd AS shall apply default caching directives as specified 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 transport resource 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 transport 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 transport resource at M2d or M10d. At the time t\_ingest + maxAge, the transport resource is 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 M4d service locations using the Expires HTTP response header or the HTTP Cache-Control directives max‑age or s‑maxage.

When distributing a transport resource 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 transport 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 transport resources (e.g., in the case the underlying 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 processing

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 transport 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 transport 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 transport 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 transport resources requested at reference point M4d that match the regular expression specified in urlSignature.‌urlPattern, whether modified by the 5GMSd 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 requested transport resource in a 200 (OK) response message (if it is able to serve that transport 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 by provisioning two or more Content Hosting Configurations as described in clause 5.2.8.2 of TS 26.510 [56] 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 each Content Hosting Configuration 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 are deployed within the 5GMS System at the discretion of the 5GMSd AF, taking into account any deployment affinity requirements as specified below.

The DistributionConfiguration.affinityGroup property within the Content Hosting Configuration (see clause 5.2.8.2 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 scope of 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 belonging 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 when this property 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), a service location associated with one distribution configuration should not be deployed together with (e.g., at the same physical location) the service location associated with the other distribution configuration.

## ===== Content Publishing Provisioning API =====

### 7.6A.1 Overview

The API used by the 5GMSu Application Provider at reference point M1u to create and manipulate the 5GMSu AS Content Publishing Configuration associated with a particular uplink media streaming Provisioning Session in the 5GMSu AF is specified in clause 8.9 of TS 26.510 [56].

Within a Content Publishing Configuration, one or more contribution configurations may be defined where each may specify different caching, purging and content preparation behaviours for content contributed at reference point M4u or M10u. The Content Publishing Configuration may further specify, through the declaration of affinity groups, how reference point M4u or M10u service locations associated with each contribution configuration are deployed in the 5GMS System.

## ===== 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 orhttp://dashif.org/ingest/v1.2/interface-2 orurn: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 orhttp://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 8.8.3.1-1 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 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 issues an HTTP 3xx redirect at reference point M2d pointing to another location, or an upstream 5GMSd AS issues such a redirect at reference point M10d, 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 by 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/2.0 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 8.9.3.1-1 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 8.9.3.1-1 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.

## ===== Media Streaming (M4) interface =====

## 10.2 DASH distribution

In the case of DASH distribution, M4d is relevant for the distribution as shown in figure 10.2-1.



Figure 10.2-1: 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 service.

 - 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].

## 10.3 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 identified 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 Content distribution from multiple service locations

### 10.3A.1 General

This clause extends clauses 10.2 and 10.3 to allow for content distribution using multiple service locations exposed by the 5GMSd AS at reference point M4d.

### 10.3A.2 Switching between multiple service locations during content distribution

The Media Player Entry (or a document pointed to by a Media Player Entry) may be used to identify multiple service locations exposed by the 5GMSd AS at reference point M4d when the Media Access Client of the 5GMSd Client is responsible for selecting a service location to acquire media. Service locations provided in the Media Player Entry may be distinguishable and identifiable via their base URLs.

When switching between multiple service locations, the Media Access Client of the 5GMSd Client may:

- Identify the different base URLs in the Media Player Entry that apply to the media resource to be downloaded.

- Select the service location used to obtain the media resource. For example, the service location selected has the highest priority for usage based on the contents of the Media Player Entry, or the Media Access Client selects the service location using internal logic. In case a previous request using a particular service location has failed, another service location may be selected.

- If applicable, identify the absolute URL or combine the base URL of the selected service location with the relative path of the transport resource identified in the Media Player Entry.

- Download the media resource from the selected service location and make it available to the Media Playback and Content Decryption Platform (as specified in TS 26.511 [35]) for immediate or delayed consumption.

### 10.3A.3 Concurrent use of multiple service locations for content distribution

The Media Player Entry (or a document pointed to by a Media Player Entry) may be used to identify multiple service locations exposed by the 5GMSd AS at reference point M4d, and to identify the method employed to access media resources listed in the Media Player Entry through simultaneous use of those multiple service locations.

When using multiple service locations concurrently, the Media Access Client of the 5GMSd Client may:

- Identify the different base URLs of the service locations provided in the Media Player Entry that apply to the media resource to be downloaded.

- Select one or more service locations to be used to obtain the media resource. For example, the service locations selected have the highest priority for usage based on the contents of the Media Player Entry, the Media Access Client selects the service locations using internal logic, or all the identified service locations are used.

- If applicable, identify the absolute URLs or combine the base URLs of the selected service locations with the relative path of the transport resources containing the original media resource identified in the Media Player Entry. In the case where a transformed transport resource (e.g., a variant of the original media resource) is distributed from each of the selected service locations, the Access Client may construct the absolute URL of each transport resource used in the request to each service location using information provided within the Media Entry Point.

- Download transport resources, where each may be the original and/or a transformed (e.g., encoded) representation of the media resource, from the identified service locations. This may include downloading (either partially or in full) transport resources from one or more reference point M4d service locations concurrently.

- Reconstitute the media resource and make it available to the Media Playback and Content Decryption Platform (specified in TS 26.511 [35]) for immediate or delayed consumption.

### 10.3A.4 Content steering for content distribution

In the case when content steering is used, the Media Access Client of the 5GMSd Client may communicate via reference point M4d with a content steering service provisioned within the 5GMSd AS to obtain information about which service location(s) to use to access transport resources at reference point M4d. Content steering information may be provided within the Media Player Entry (e.g., a DASH MPD) or in a document pointed to by the Media Player Entry.

When obtaining content steering information from the content steering service, the Media Access Client shall use a protocol appropriate to that service.

## 10.4 Contribution protocols

### 10.4.1 General

The contribution protocols supported by the 5GMSu AS at reference point M4u and M10u are listed in table 10.4.1-1 below:

Table 10.4.1-1: Supported contribution protocols at reference point M4u and M10u

|  |  |  |
| --- | --- | --- |
| Description | Term identifier | Clause |
| DASH-IF push-based content ingest protocol | http://dashif.org/ingest/v1.2/interface-1 | 10.4.2 |

### 10.4.2 DASH-IF push-based contribution protocol

If streamingAccess.‌entryPoints.‌protocol is set to http://dashif.org/ingest/v1.2/interface-1 in the Service Access Information, media resources shall be streamed to the 5GMSu AS as specified by the DASH‑IF Live Media Ingest specification Interface-1 [3]. The content shall conform to at least one of the conformance profiles listed in streamingAccess.profiles, if any.

The content uploaded to the 5GMSu AS using this protocol is processed according to the Content Preparation Template(s) specified in the corresponding Content Publishing Configuration (if any), and the result is made available to the 5GMSu Application Service Provider at reference point M2u or to another 5GMSu AS at reference point M10u using the egest protocol indicated in EgestConfiguration as specified in clause 8.

### 10.4.3 Concurrent use of service locations for content contribution

The Media Streamer Entry (or a document pointed to by the Media Streamer Entry) shall be used to identify multiple service locations exposed by the 5GMSu AS at reference point M4u and the method used to contribute transport resources to the 5GMSu through simultaneous use of those multiple service locations. The following applies:

- Service locations provided in the Media Streamer Entry shall be distinguishable and identifiable via their base URLs.

- Any necessary configuration information required by the Access Client of the 5GMSu Client to contribute transport resources to multiple service locations concurrently shall be provided within the Media Streamer Entry.

When using multiple service locations concurrently, it is the responsibility of the Media Access Client of the 5GMSu Client to:

- Identify the different base URLs in the Media Streamer Entry that apply to the media resource to be contributed.

- Select one or more service locations to be used to upload the media resource. For example, the service locations selected have the highest priority for usage based on the contents of the Media Streamer Entry, the Access Client selects the service locations using internal logic, or all the identified service locations are used.

- If applicable, identify the absolute URLs or combine the base URLs of the selected service locations with the relative path of the transport resource identified in the Media Streamer Entry. In the case where uniquely identifiable transport resources are used to contribute partial representations of the media resource to each of the selected service locations, the Media Access Client shall either identify or construct the absolute URLs of the transport resource used to transmit the original media resource to each service location.

- Prepare and upload the transport resources containing complete or partial representations of the media resource to the identified service locations. This may include uploading (either partially or in full) the media resource and/or the transport resources to one or more reference point M4u service locations concurrently.

## ===== 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 property shall be populated with the URL of the Media Player Entry (e.g., a MPD resource) or a document pointing to the MPD resource) that was retrieved at reference point M4d after following any HTTP redirects.

- 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.

## ===== UE Media Stream Handler (M7/M11 APIs =====

## 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 as described in clause 10.3A.2, communication with a content steering service as described in clause 10.3A.4, and the download and decoding of coded objects as described in clause 10.3A.3.

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>.

## ===== Pull-based content ingest example =====

## B.1.2 Desired URL mapping

In the example shown in table B.1.2‑1 below, media resources are exposed by a reference point M4d service location with a default canonical domain name dist-loc.com-provider-service.‌ms.‌as.‌3gppservices.‌org. This domain name is assigned by the 5GMSd AF based on a Provisioning Session with external identifier com.provider.service and a Content Hosting Configuration distribution configuration with distribution identifier dist.loc. The 5GMSd Application Provider has also assigned a custom domain name alias 5gms.provider.com by defining DistributionConfiguration.domainNameAlias in the same distribution configuration. The base URL of the 5GMSd Application Provider’s origin server is https://origin.provider.com/media.

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

|  |  |
| --- | --- |
| M4d request from 5GMSd Client | Mapped M2d request to origin serveron 5GMSd AS cache miss |
| https://**dist-loc.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://**dist-loc.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://**dist-loc.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 |
| ProvisioningSession |
|  externalServiceId | com.provider.service | 5GMSd Application Provider*(M1d request)* |
| IngestConfiguration |
|  protocol | urn:3gpp:5gms:content-protocol:**http-pull** | 5GMSd Application Provider*(M1d request)* |
|  mode | PULL |
|  baseURL | https://origin.provider.com/media |
| DistributionConfiguration |
|  *distributionId* | dist.loc | 5GMSd Application Provider*(M1d request)* |
|  canonicalDomainName | dist.loc.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)* |

## ===== Push-based content ingest example =====

## B.2.1 Desired URL mapping

In the example shown in table B.2.1‑1, media resources are exposed by a reference point M4d service location with a default canonical domain name dist-loc.com-provider-service.‌ms.‌as.‌3gppservices.‌org. This domain name is assigned by the 5GMSd AF based on a for the Provisioning Session with external identifier com.provider.service and a Content Hosting Configuration distribution configuration with distribution identifier dist-loc. The 5GMSd Application Provider also assigns a custom domain name alias 5gms.provider.com by defining DistributionConfiguration.domainNameAlias in the same distribution configuration. Media resources are pushed into the 5GMSd AS at M2d by the 5GMSd Application Provider using the ingest base URL https://5gmsd-as.mno.net/com-provider-service chosen by the 5GMSd AF.

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://**dist-loc.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://**dist-loc.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://**dist-loc.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 |
| ProvisioningSession |
|  externalServiceId | com.provider.service | 5GMSd Application Provider*(M1d request)* |
| 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 |
|  *distributionId* | dist.loc | 5GMSd Application Provider*(M1d request)* |
|  canonicalDomainName | dist-loc.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)* |

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

# 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 (see clause 5.2.8.2 of TS 26.510 [56]). In this example, one 5GMSd AS (edge.5gms.provider.com) is acting as an edge proxy while its upstream 5GMSd AS (shield.5gms.provider.com) is providing an origin shield function.

1. The 5GMSd Client on the UE requests a media resource via reference point 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 reference point 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.provider.service.edge are exposed at M4d from a default canonical domain dist-loc.com-provider-service-edge.ms.‌as.‌3gppservices.‌org determined by the 5GMSd Application Provider, and a custom domain name alias edge.5gms.provider.com has also been configured by the 5GMSd Application Provider.

2. Media resources for the Provisioning Session with external identifier com.provider.service.shield are exposed at M10d (and potentially M4d) from a default canonical domain dist-loc.com-provider-service-shield.ms.‌as.‌3gppservices.‌org determined by the 5GMSd Application Provider, and a custom domain name alias shield.5gms.provider.com has also been configured by the 5GMSd Application Provider. The base URL of the 5GMSd Application Provider’s origin server is https://origin.provider.com/media.

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 serveron 5GMSd AS cache miss |
| https://**dist-loc.com-provider-service-edge.ms.as****.3gppservices.org**/**asset123456**/**video1**/segment1000.mp4 | https://**dist-loc.com-provider-service-shield.ms.as****.3gppservices.org**/**asset123456**/**video1**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**video1**/segment1000.mp4 |
| https://**edge.5gms.provider.com**/‌**asset123456**/**video1**/segment1000.mp4 | https://**shield.5gms.provider.com**/‌**asset123456**/**video1**/segment1000.mp4 |
| https://**dist-loc.com-provider-service-edge.ms.as****.3gppservices.org**/**asset123456**/**video2**/segment1000.mp4 | https://**dist-loc.com-provider-service-shield.ms.as****.3gppservices.org**/**asset123456**/**video2**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**video2**/segment1000.mp4 |
| https://**edge.5gms.provider.com**/‌**asset123456**/**video2**/segment1000.mp4 | https://**shield.5gms.provider.com**/‌**asset123456**/**video2**/segment1000.mp4 |
| https://**dist-loc.com-provider-service-edge.ms.as****.3gppservices.org**/**asset123456**/**audio1**/segment1000.mp4 | https://**dist-loc.com-provider-service-shield.ms.as****.3gppservices.org**/**asset123456**/**audio1**/segment1000.mp4 | https://origin.provider.com/‌media/‌**asset123456**/**audio1**/segment1000.mp4 |
| https://**edge.5gms.provider.com**/‌**asset123456**/**audio1**/segment1000.mp4 | https://**shield.5gms.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.3.3‑1: Origin server-facing 5GMSd AS Content Hosting Configuration properties
relevant to pull-based ingest

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

Table B.3.3‑2: Client-facing 5GMSd AS Content Hosting Configuration properties
relevant to pull-based ingest

|  |  |  |
| --- | --- | --- |
| Property | Example value | Set by |
| ProvisioningSession |
|  externalServiceId | com.provider.service.edge | 5GMSd Application Provider*(M1d request)* |
| IngestConfiguration |
|  protocol | urn:3gpp:5gms:content-protocol:**http-pull** | 5GMSd Application Provider*(M1d request)* |
|  mode | PULL |
|  baseURL | https://dist-loc.com-provider-service-shield.ms.as.3gppservices.org |
| https://shield.5gms.provider.com/ |
| DistributionConfiguration |
|  distributionId | dist.loc | 5GMSd Application Provider*(M1d request)* |
|  canonicalDomainName | dist-loc.com-provider-service-edge.ms.as.3gppservices.org | 5GMSd AF*(M1d response)* |
|  domainNameAlias | edge.5gms.provider.com | 5GMSd Application Provider(*M1d request)* |
|  baseURL | https://edge.5gms.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 (see clause 5.2.8.2 of TS 26.510 [56]).

1. The 5GMSd Application Provider uploads content to the origin server-facing 5GMSd AS using push-based ingest via reference point 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.provider.service.edge are pushed into the client-facing 5GMSd AS at M10d by the origin server-facing 5GMSd AS. These media resources are exposed to the 5GMSd Client at M4d using the canonical name of the client-facing 5GMSd AS dist-loc.com-provider-service-edge.‌ms.‌as.‌3gppservices.org and an additional domain name alias edge.5gms.provider.com configured by the 5GMSd Application Provider. The ingest base URL populated by the 5GMSd AF is https://5gmsd-as-edge.mno.net/com-provider-service-edge.

2. Media resources for the Provisioning Session with external identifier com.provider.service.shield 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. The canonical domain name and base URL of the distribution pushing media resources to the client-facing 5GMSd AS are determined when provisioning the client-facing 5GMSd AS. The ingest base URL populated by the 5GMSd AF is https://5gmsd-as-shield.mno.net/com-provider-service-shield.

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-shield.mno.net/com-provider-service-shield/**asset123456**/**video1**/segment1000.mp4 | https://5gmsd-as-edge.mno.net/‌com-provider-service-edge/**asset123456**/**video1**/segment1000.mp4 | https://**dist-loc.com-provider-service-edge.ms.as****.3gppservices.org**/**asset123456**/**video1**/segment1000.mp4 |
| https://**edge**.5gms.provider.com/‌asset123456/video1/segment1000.mp4 |
| https://5gmsd-as-shield.mno.net/com-provider-service-shield/**asset123456**/**video2**/segment1000.mp4 | https://5gmsd-as-edge.mno.net/‌com-provider-service-edge/**asset123456**/**video2**/segment1000.mp4 | https://**dist-loc.com-provider-service-edge.ms.as.****3gppservices.org**/**asset123456**/**video2**/segment1000.mp4 |
| https://**edge**.5gms.provider.com/‌asset123456/video2/segment1000.mp4 |
| https://5gmsd-as-shield.mno.net/com-provider-service-shield/**asset123456**/**audio1**/segment1000.mp4 | https://5gmsd-as-edge.mno.net/‌com-provider-service-edge/**asset123456**/**audio1**/segment1000.mp4 | https://**dist-loc.com-provider-service-edge.ms.as.3gppservices.org**/**asset123456**/**audio1**/segment1000.mp4 |
| https://**edge**.5gms.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.4.2‑1: Client-facing Content Hosting Configuration properties
relevant to push-based ingest

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

Table B.4.2‑2: Origin server-facing Content Hosting Configuration properties
relevant to push-based ingest

|  |  |  |
| --- | --- | --- |
| Property | Example value | Set by |
| ProvisioningSession |
|  externalServiceId | com.provider.service.shield | 5GMSd Application Provider*(M1d request)* |
| IngestConfiguration |
|  protocol | http://dashif.org/‌ingest/‌v1.2‌/interface-1 | 5GMSd Application Provider*(M1d request)* |
|  mode | PUSH |
|  baseURL | https://5gmsd-as-shield.mno.net/‌com-provider-service-shield/ | 5GMSd AF*(M1d response)* |
| DistributionConfiguration |
|  *mode* | PUSH | 5GMSd Application Provider*(M1d request)* |
|  *distributionId* | dist.loc |
|  baseURL | https://5gmsd-as-edge.mno.net/‌com-provider-service-edge/ |