**3GPP TSG-S4 Meeting #132*****S4-250759***

**Fukuoka, JP, 19th–23rd May 2025** revision of S4aI250076

|  |
| --- |
| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **26.512** | **CR** | **0089** | **rev** | **1** | **Current version:** | **18.5.0** |  |
|  |
| *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)*.* |
|  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

|  |
| --- |
|  |
| ***Title:***  |  |
|  |  |
| ***Source to WG:*** | BBC |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** | AMD\_PRO-MED |  | ***Date:*** | 2025-05-07 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-19 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories 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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | Satisfy the objectives of Work Task 1 “Common Media Client Data” as documented in S4-250689. |
|  |  |
| ***Summary of change:*** | * Provisioning of CMCD-based metrics reporting at reference point M1.
* 5GMS Client metrics reporting configuration using Service Access Information at reference point M5.
* Media Player configuration via client API at reference point M7/M11.
* Reporting of CMCD information by the 5GMS AS to the 5GMS AF at reference point M3 using a new JSON-based reporting format.
* Exposure of CMCD information by the Data Collection AF instantiated in the 5GMS AF to event consumers at reference points R5 and/or R6.
 |
|  |  |
| ***Consequences if not approved:*** | Objectives of the Work Item not completely satisfied. |
| ***Q*** |  |
| ***Clauses affected:*** | 2, 4.2, 4.5, 4.5.4.1, 4.5.5.1, 4.5.6 (new), 4.5.7 (new), 4.5.8 (new), 4.5.9 (new), 4.5.10 (new), 4.7.5, 6.2.3.6, 7.8.1, 8.1, 9.4.3, 9.5.3, 10.1A, 10.5 (new), 11, 11.1, 11.2.1, 11.4.1, 11.4.3, 11.4.3.1, 11.4.3.2, 11.4.3.3, 13.2.4, 13.2.5, 18.3.2, 18.3.3 (new), C.6 (new), E.2, E.2.1, E.2.2, E.2.3 (new), E.2.4 (new), E.2.5 (new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications | TS 26.510 CR0021 |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | CR [S4aI250076]: Submitted for WG *ad hoc* agreement.CRr1 [S4-250759]: Submitted for WG endorsement:* Refactored OpenAPI design to move all CMCD references into this change under a new *ClientData* sub-envelope, which now includes an optional *requestURL* property providing context.
* Renamed CMCD property and class names from …*Data* to …*Info*.
* Added basic configuration API (clause 13.2.4) and errors (clause 13.2.5).
 |

# 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/1/commits>

The proposed changes are reproduced below for posterity.

[**TS26512\_ClientData.yaml**](https://forge.3gpp.org/rep/sa4/amd-pro-med/-/compare/REL-19...cmcd?from_project_id=9#a049085f35e1426c71387a1d88e66fe74168ce64)

|  |  |  |
| --- | --- | --- |
|  |  | openapi: 3.0.0  |
|  |  | info:  |
|  |  | title: '5G Media Streaming: Client data syntax for QoE metrics reporting'  |
|  |  | version: 1.0.0  |
|  |  | description: |  |
|  |  | 5GMS client data syntax for QoE metrics reporting  |
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|  |  |  |
|  |  | tags:  |
|  |  | - name: '5GMS client data syntax for QoE metrics reporting'  |
|  |  | description: '5G Media Streaming: Client data syntax for use in QoE metrics reporting envelope'  |
|  |  |  |
|  |  | externalDocs:  |
|  |  | description: 'TS 26.512 V19.0.0; 5G Media Streaming (5GMS); Protocols'  |
|  |  | url: 'https://www.3gpp.org/ftp/Specs/archive/26\_series/26.512/'  |
|  |  |  |
|  |  | paths: {}  |
|  |  |  |
|  |  | components:  |
|  |  | schemas:  |
|  |  | ClientData:  |
|  |  | description: 'Envelope for client data pertaining to the 5G Media Streaming System.'  |
|  |  | type: object  |
|  |  | required:  |
|  |  | - requestUrl  |
|  |  | anyOf:  |
|  |  | - required: [cmcdSessionInfo]  |
|  |  | - required: [cmcdObjectInfo]  |
|  |  | - required: [cmcdRequestInfo]  |
|  |  | - required: [cmcdStatusInfo]  |
|  |  | properties:  |
|  |  | requestUrl:  |
|  |  | $ref: 'TS26510\_CommonData.yaml#/components/schemas/AbsoluteUrl'  |
|  |  | cmcdSessionInfo:  |
|  |  | $ref: '#/components/schemas/CmcdSessionInfo'  |
|  |  | cmcdObjectInfo:  |
|  |  | $ref: '#/components/schemas/CmcdObjectInfo'  |
|  |  | cmcdRequestInfo:  |
|  |  | $ref: '#/components/schemas/CmcdRequestInfo'  |
|  |  | cmcdStatusInfo:  |
|  |  | $ref: '#/components/schemas/CmcdStatusInfo'  |
|  |  |  |
|  |  | *##########################################*  |
|  |  | *# Common Media Client Data per CTA-5004 V1*  |
|  |  | *##########################################*  |
|  |  | CmcdSessionInfo:  |
|  |  | description: 'An object containing session-scope CMCD keys'  |
|  |  | type: object  |
|  |  | required:  |
|  |  | - sid  |
|  |  | properties:  |
|  |  | v:  |
|  |  | description: 'CMCD version'  |
|  |  | type: integer  |
|  |  | minimum: 1  |
|  |  | sid:  |
|  |  | description: 'Session identifier'  |
|  |  | type: string  |
|  |  | cid:  |
|  |  | description: 'Content identifier'  |
|  |  | type: string  |
|  |  | st:  |
|  |  | allOf:  |
|  |  | - description: 'Stream type'  |
|  |  | - $ref: '#/components/schemas/CmcdStreamType'  |
|  |  | sf:  |
|  |  | allOf:  |
|  |  | - description: 'Streaming format'  |
|  |  | - $ref: '#/components/schemas/CmcdStreamingFormat'  |
|  |  | pr:  |
|  |  | description: 'Playback rate'  |
|  |  | type: number  |
|  |  |  |
|  |  | CmcdObjectInfo:  |
|  |  | description: 'An object containing object-scope CMCD keys'  |
|  |  | type: object  |
|  |  | properties:  |
|  |  | ot:  |
|  |  | allOf:  |
|  |  | - description: 'Object type'  |
|  |  | - $ref: '#/components/schemas/CmcdObjectType'  |
|  |  | d:  |
|  |  | description: 'Object duration (milliseconds)'  |
|  |  | type: integer  |
|  |  | br:  |
|  |  | description: 'Encoded bit rate (kilobits per second)'  |
|  |  | type: integer  |
|  |  | tb:  |
|  |  | description: 'Top bit rate (kilobits per second)'  |
|  |  | type: integer  |
|  |  |  |
|  |  | CmcdRequestInfo:  |
|  |  | description: 'An object containing request-scope CMCD keys'  |
|  |  | type: object  |
|  |  | properties:  |
|  |  | su:  |
|  |  | description: 'Start-up'  |
|  |  | type: boolean  |
|  |  | mtp:  |
|  |  | description: 'Measured throughput (kilobits per second)'  |
|  |  | type: integer  |
|  |  | dl:  |
|  |  | description: 'Deadline (milliseconds)'  |
|  |  | type: integer  |
|  |  | bl:  |
|  |  | description: 'Buffer length (milliseconds)'  |
|  |  | type: integer  |
|  |  | nor:  |
|  |  | allOf:  |
|  |  | - description: 'Next object request'  |
|  |  | - $ref: 'TS26510\_CommonData.yaml#/components/schemas/RelativeUrl'  |
|  |  | nrr:  |
|  |  | description: 'Next range request'  |
|  |  | type: string  |
|  |  |  |
|  |  | CmcdStatusInfo:  |
|  |  | description: 'An object containing status-scope CMCD keys'  |
|  |  | type: object  |
|  |  | properties:  |
|  |  | rtp:  |
|  |  | description: 'Requested maximum throughput (kilobits per second)'  |
|  |  | type: integer  |
|  |  | bs:  |
|  |  | description: 'Buffer starvation'  |
|  |  | type: boolean  |
|  |  |  |
|  |  | CmcdStreamType:  |
|  |  | description: 'Stream type'  |
|  |  | type: string  |
|  |  | enum: [v, l]  |
|  |  |  |
|  |  | CmcdStreamingFormat:  |
|  |  | description: 'Streaming format'  |
|  |  | type: string  |
|  |  | enum: [d, h, s, o]  |
|  |  |  |
|  |  | CmcdObjectType:  |
|  |  | description: 'Media type of object'  |
|  |  | type: string  |
|  |  | enum: [m, a, v, av, i, c, tt, k, o] |

[**TS26512\_Mas\_Configuration\_ContentHosting.yaml**](https://forge.3gpp.org/rep/sa4/amd-pro-med/-/compare/REL-19...cmcd?from_project_id=9https://forge.3gpp.org/rep/sa4/amd-pro-med/-/compare/REL-19...cmcd?from_project_id=9#4200fcbfae802ad4a83574d154dafbe2dd6e027b)

|  |  |  |
| --- | --- | --- |
|  |  | openapi: 3.0.0  |
|  |  | info:  |
|  |  | title: Mas\_Configuration\_ContentHosting  |
|  |  | version: 1.0.1  |
|  |  | version: 1.1.0  |
|  |  | description: |  |
|  |  | 5GMS AS Configuration API: Content Hosting  |
|  |  | © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).  |
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|  |  |  |
|  |  | tags:  |
| ... | ... | @@ -12,7 +12,7 @@ tags: |
|  |  | description: '5G Media Streaming: Application Server Configuration (M3) APIs: Content Hosting'  |
|  |  |  |
|  |  | externalDocs:  |
|  |  | description: 'TS 26.512 V18.4.0; 5G Media Streaming (5GMS); Protocols'  |
|  |  | description: 'TS 26.512 V19.0.0; 5G Media Streaming (5GMS); Protocols'  |
|  |  | url: 'https://www.3gpp.org/ftp/Specs/archive/26\_series/26.512/'  |
|  |  |  |
|  |  | servers:  |
| ... | ... | @@ -352,11 +352,14 @@ components: |
|  |  | description: "A representation of a Content Hosting Configuration resource used to configure a Media AS."  |
|  |  | required:  |
|  |  | - name  |
|  |  | - externalServiceId  |
|  |  | - ingestConfiguration  |
|  |  | - distributionConfigurations  |
|  |  | properties:  |
|  |  | name:  |
|  |  | type: string  |
|  |  | externalServiceId:  |
|  |  | type: string  |
|  |  | ingestConfiguration:  |
|  |  | $ref: 'TS26510\_Maf\_Provisioning\_ContentHosting.yaml#/components/schemas/IngestConfiguration'  |
|  |  | distributionConfigurations:  |
| ... | ... |  |

[**TS26512\_Mas\_Configuration\_ContentPublishing.yaml**](https://forge.3gpp.org/rep/sa4/amd-pro-med/-/compare/REL-19...cmcd?from_project_id=9https://forge.3gpp.org/rep/sa4/amd-pro-med/-/compare/REL-19...cmcd?from_project_id=9#0ceb59284e7082cee6f70ac2628d660702f54e12)

|  |  |  |
| --- | --- | --- |
|  |  | openapi: 3.0.0  |
|  |  | info:  |
|  |  | title: Mas\_Configuration\_ContentPublishing  |
|  |  | version: 1.0.1  |
|  |  | version: 1.1.0  |
|  |  | description: |  |
|  |  | 5GMS AS Configuration API: Content Publishing  |
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|  |  | All rights reserved.  |
|  |  |  |
|  |  | tags:  |
| ... | ... | @@ -12,7 +12,7 @@ tags: |
|  |  | description: '5G Media Streaming: Application Server Configuration (M3) APIs: Content Publishing'  |
|  |  |  |
|  |  | externalDocs:  |
|  |  | description: 'TS 26.512 V18.4.0; 5G Media Streaming (5GMS); Protocols'  |
|  |  | description: 'TS 26.512 V19.0.0; 5G Media Streaming (5GMS); Protocols'  |
|  |  | url: 'https://www.3gpp.org/ftp/Specs/archive/26\_series/26.512/'  |
|  |  |  |
|  |  | servers:  |
| ... | ... | @@ -352,11 +352,14 @@ components: |
|  |  | description: "A representation of a Content Publishing Configuration resource used to configure a Media AS."  |
|  |  | required:  |
|  |  | - name  |
|  |  | - externalServiceId  |
|  |  | - contributionConfigurations  |
|  |  | - egestConfiguration  |
|  |  | properties:  |
|  |  | name:  |
|  |  | type: string  |
|  |  | externalServiceId:  |
|  |  | type: string  |
|  |  | contributionConfigurations:  |
|  |  | type: array  |
|  |  | items:  |
| ... | ... |  |

change

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

## - For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

(Snip)

[CMCDv1] CTA-5004: "Web Application Video Ecosystem: Common Media Client Data (CMCD)", September 2020.

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 |
| M3d | Server Certificates configuration API | 9.2 |
| Content Preparation Templates configuration API | 9.3 |
| Content Hosting configuration API | 9.4 |
| M4d | MPEG‑DASH [4] or 3GP‑DASH [37] or DASH-IF push-based content distribution | 10 |
| M5d | Service Access Information API | 11.2 |
| Metrics reporting | The 5GMSd Client or 5GMSd AS 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 |
| M3d | Service Access Information API | 11.2 |
| Metrics Reporting configuration API | 11.4 |
| 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 |

Media AS Configuration Procedures (M3)

## 4.5 Procedures of the M3 interface

#### 4.5.4.1 General

The 5GMSd AF shall configure Content Hosting Configuration resources of type Application‌Server‌Content‌Hosting‌Configuration in the 5GMSd AS using the procedures defined in this clause such that they remain synchronised with the Content Hosting Configurations provisioned at reference point M1 using the procedures defined in clause 4.3.3.

The format of the Content Hosting Configuration resource representation at reference point M3d is as specified in clause 8.8.3.1 of TS 26.510 [56]. The 5GMSd AF shall populate the externalServiceIdentifier property with the external service identifier from the parent Provisioning Session to enable the 5GMSd AS to retrieve Service Access Information from the 5GMSd AF at reference point M3d (see clause 4.5.6). The 5GMSd AF shall populate the canonicalDomainName and baseURL properties of each distribution configuration with the values it has chosen.

NOTE: The 5GMSd AS implementation converts received Content Hosting Configurations into a format suitable for configuring the HTTP server that realises the content hosting feature.

#### 4.5.5.1 General

The 5GMSu AF shall configure Content Publishing Configuration resources of type Application‌Server‌Content‌Publishing‌Configuration in the 5GMSu AS using the procedures defined in this clause such that they remain synchronised with the Content Publishing Configurations provisioned at reference point M1 using the procedures defined in clause 4.3.3.

The format of the Content Publishing Configuration resource representation at reference point M3 is as specified in clause 8.9.3.1 of TS 26.510 [56]. The 5GMSu AF shall populate the externalServiceIdentifier property with the external service identifier from the parent Provisioning Session to enable the 5GMSu AS to retrieve Service Access Information from the 5GMSu AF at reference point M3u (see clause 4.5.6). The 5GMSu AF shall populate the canonicalDomainName and baseURL properties of each contribution configuration with the values it has chosen.

NOTE: The 5GMSu AS implementation converts received Content Publishing Configurations into a format suitable for configuring the HTTP server that realises the content publishing feature.

Media Session Handling Procedures (M3)

### 4.5.6 Service Access Information procedures

Service Access Information includes configuration information to allow the 5GMS AS to invoke at reference point M3 procedures for dynamic policy (see clause 4.5.7), consumption reporting (clause 4.5.8), metrics reporting (clause 4.5.9) and network assistance (clause 4.5.10). For any of these purposes, the 5GMS AS shall obtain Service Access Information from the 5GMS AF using the operations specified in clause 5.3.2 of TS 26.510 [56] at reference point M3d, citing an external service identifier and the Service Access Information is derived by the 5GMS AF from the Provisioning Session established at reference point M1d (see clause 4.3.2) that is tagged with the same external service identifier.

In this version of the present document, the properties of the Service Access Information resource shall be populated as follows at reference point M3 based on the properties and sub-resources of the corresponding Provisioning Session:

- The provisioningSessionId and provisioningSessionType properties are present, as required by TS 26.510 [56].

- The locationReporting property is present, as required by TS 26.510 [56], and shall be set to false.

- The streamingAccess object shall be present if provisioned in the Content Hosting Configuration or Content Publishing Configuration resource.

- If any of the metrics reporting including CMCD reporting configurations listed in table 7.8.1‑1 are provisioned per clause 4.3.9, the client‌Metrics‌Reporting‌Configurations array shall be present and populated with an object corresponding to each metrics reporting configuration. Metrics Reporting Configurations for any other metrics schemes shall not be included in the client‌Metrics‌Reporting‌Configurations array.

All other properties of the Service Access Information resource shall be omitted when served at reference point M3.

### 4.5.7 Dynamic policy invocation procedures

Dynamic policy invocation at reference point M3 is not supported by the 5GMS System in this release.

### 4.5.8 Consumption reporting procedures

Consumption reporting at reference point M3 is not supported by the 5GMS System in this release.

### 4.5.9 Metrics reporting procedures

These procedures are used by the metrics reporting function of the 5GMS AS to submit QoE metrics reports including CMCD reporting to the 5GMS AF via reference point M3u if metrics reporting is applied for a media streaming session. To determine whether and how to send metrics reports to the 5GMS AF at reference point M3u, the 5GMS AS shall use the procedures and operations specified in clause 5.3.5 of TS 26.510 [56].

- If any of the CMCD metrics schemes specified in table 7.8.1‑1 are indicated in a client metrics reporting configuration of the Service Access Information provided to the 5GMSd AS at reference point M3d (see clause 4.5.6), the 5GMSd AS shall report CMCD information to the 5GMSd AF at reference point M3d using the API specified in clause 11.4.1 and the report format specified in clause 11.4.3.3.

### 4.5.10 Network Assistance procedures

Network Assistance is not supported by the 5GMS System at reference point M3 in this release.

Procedures for Service Access Information (M5)

#### 4.7.2.1 General

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

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

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

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

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

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

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

If one or more Metrics Reporting Configurations are provisioned per clause 4.3.9, a subset of these is included in the corresponding Service Access Information provided to the Media Session Handler at reference point M5d as follows:

- If the metrics scheme urn:‌3GPP:‌ns:‌PSS:‌DASH:‌QM10 is indicated in the metrics reporting configuration of a Provisioning Session for downlink media streaming, a corresponding client metrics reporting configuration shall be included in the Service Access Information provided to the Media Session Handler at reference point M5d to enable QoE metrics reporting for DASH-based downlink media streaming by the 5GMSd Client at reference point M5d per clause 11.4.3.2.

- If the metrics scheme specified in clause 9.3 of TS 26.118 [42] is indicated in the metrics reporting configuration of a Provisioning Session for downlink media streaming, a corresponding client metrics reporting configuration shall be included in the Service Access Information provided to the Media Session Handler at reference point M5d to enable QoE metrics reporting for Virtual Reality media by the 5GMSd Client at reference point M5d per clause 11.4.3.2.

- If any of the CMCD metrics schemes listed in table 7.8.1‑1 are indicated in the metrics reporting configuration of a Provisioning Session for downlink media streaming, a corresponding client metrics reporting configuration shall be included in the Service Access Information provided to the Media Session Handler at reference point M5d to enable metrics reporting of CMCD information by the 5GMSd Client to the 5GMSd AS at reference point M4d per [CMCDv1].

If an Edge Resources Configuration with client-driven management is provisioned per clause 4.3.10, a Client Edge Resources Configuration is included in the corresponding Service Access Information.

Procedures for metrics reporting (M3)

### 4.7.5 Procedures for metrics reporting

These procedures are used by the Media Session Handler and the Metrics Reporting function of the 5GMS Client to submit QoE metrics reports to the 5GMS AF via reference point M5 if metrics reporting is applied for a media streaming session. To determine whether and how to send metrics reports the 5GMS AF at reference point M5, the Media Session Handler shall use the procedures and operations specified in clause 5.3.5 of TS 26.510 [56].

When the metrics collection and reporting feature is provisioned for a media streaming Provisioning Session, one or more Client Metrics Reporting Configurations, each associated with a metrics scheme, are provided to the 5GMS Client in the Service Access Information (see clause 4.7.2).

- For progressive download and DASH streaming services, the listed metrics in a given Client Metrics Reporting Configuration are associated with the 3GPP metrics scheme and shall correspond to one or more of the metrics as specified in clauses 10.3 and 10.4, respectively, of TS 26.247 [4]. When individual metrics or groups of metrics are to be reported, these are identified using controlled terms from the vocabulary specified in clause E.2.1.

- For downlink DASH streaming services, CMCD information within the scope of one of the CMCD metrics schemes listed in table 7.8.1‑1 may be listed in a Metrics Reporting Configuration. When individual metrics or groups of metrics are to be reported, these are identified using controlled terms from the vocabulary specified in clause E.2.5. As a result, the Media Player is configured by the Media Session Handler at reference point M11d to report the corresponding CMCD information to the 5GMSd AS at reference point M4d using either HTTP request headers or URL query parameters, as specified in [CMCDv1].

- Metrics relating to Virtual Reality media, as specified in clause 9.3 of TS 26.118 [42], may be listed in a Client Metrics Reporting Configuration. When individual metrics or groups of metrics are to be reported, these are identified using controlled terms from the vocabulary specified in clause E.2.2.

- Metrics relating to eMBMS delivery, as specified in clause 9.4.6 of TS 26.346 [51], may be listed in a Client Metrics Reporting Configuration.

NOTE: Metrics reporting for MBS is not specified by TS 26.517 [64] in this version of the present document.

Usage of HTTP headers

#### 6.2.3.6 Media delivery session identifier

At applicable reference points, the media delivery session identifier specified in clause 7.3.2 of TS 26.510 [56] shall be conveyed in the HTTP header CMCD-Session:sid as specified in table 1 of CTA‑5004 [65]. As such, the media delivery session identifier for 5G Media Streaming shall be a UUID [66].

EXAMPLE: CMCD-Session:sid: 8bf9f090-82fd-4686-aa4a-39e6a9381b76

Metrics reporting PRovisioning API (M1)

### 7.8.1 Overview

The API used by the 5GMS Application Provider at reference point M1 to instantiate and manipulate Metrics Reporting Configurations associated with a particular downlink or uplink media streaming Provisioning Session in the 5GMS AF is specified in clause 8.11 of TS 25.510 [56].

In the case of downlink media streaming, the metrics scheme indicated in the scheme property of the Metrics Reporting Configuration shall be urn:‌3GPP:‌ns:‌PSS:‌DASH:‌QM10 and the QoE metrics (if any) listed in the metrics property shall be term identifiers from the vocabulary specified in clause E.2.1.

In the case of downlink DASH media streaming, any of the CMCD metrics schemes listed in table 7.8.1‑1 below may be provisioned, each one in the scheme property of a separate Metrics Reporting Configuration. The metrics (if any) listed in the metrics property shall be term identifiers from the vocabulary specified in clause E.2.5.

Table 7.8.1‑1: CMCD metrics scheme identifiers

|  |  |  |
| --- | --- | --- |
| CMCD information scheme | Applicability | Metrics scheme identifier |
| CMCD per-session information | Downlink | urn:3gpp:5gms:metrics:common-media-client-data:session |
| CMCD per-object information | Downlink | urn:3gpp:5gms:metrics:common-media-client-data:object |
| CMCD per-request information | Downlink | urn:3gpp:5gms:metrics:common-media-client-data:request |
| CMCD status information | Downlink | urn:3gpp:5gms:metrics:common-media-client-data:status |

Metrics related to Virtual Reality media, as specified in TS 26.118 [42] clause 9.3, may be listed in the metrics property of a metrics configuration when the scheme property indicates that metrics scheme. These shall be term identifiers from the vocabulary specified in clause E.2.2.

No standardised metrics schemes are defined in the present document for uplink media streaming.

Media Ingest and Publish protocols (M2)

## 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 |
| 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 |
| 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. |

CMCD information conveyed to the 5GMSd AS at reference point M4d (see clause 10.5) shall not be included in requests to the 5GMSd Application Provider at reference point M2d.

Application Server configuration (M3) APIs

### 9.4.3 Data model

The representation of the Content Hosting Configuration resource used by the 5GMSd AF to configure the 5GMSd AS at reference point M3d shall be the same as that specified in clause 8.8.3.1 of TS 26.510 [56] except that:

- externalServiceIdentifier is an additional read/write property of Application‌Server‌ContentHosting‌Configuration populated by the 5GMSd AF from the parent Provisioning Session.

- canonicalDomainName and baseURL are read/write properties of ApplicationServer‌Distribution‌Configuration set by the 5GMS AF.

### 9.5.3 Data model

The representation of the Content Publishing Configuration resource used by the 5GMSu AF to configure the 5GMSu AS at reference point M3u shall be the same as that specified in clause 8.9.3.1 of TS 26.510 [56] except that:

- externalServiceIdentifier is an additional read/write property of Application‌Server‌ContentPublishing‌Configuration populated by the 5GMSu AF from the parent Provisioning Session.

- canonicalDomainName and baseURL are read/write properties of ApplicationServer‌Contribution‌Configurationset by the 5GMS AF.

Media Streaming (M4)

## 10.1A Media delivery session identification

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

## 10.5 In-band client data reporting

If one or more of the CMCD metrics schemes specified in table 7.8.1‑1 is indicated in the client metrics reporting configurations provided to the Media Session Handler, the corresponding class(es) of CMCD information shall be collected by the Media Player and reported to the 5GMSd AS at reference point M4d per [CMCDv1]. The use by the Media Player of HTTP request headers or URL query parameters to report the CMCD information is governed by the configuration and settings API specified in clause 13.2.4.

NOTE: Section 3.1 of the CMCD specification [CMCDv1] recommends that HTTP request headers and URL query parameters are sent in alphabetical order of key name. This reduces the fingerprinting surface exposed by the Media Player.

Metrics reporting aPI (M5/M3)

# 11 Media Session Handling (M5/M3) APIs

## 11.1 General

This clause defines the Media Session Handling APIs used by the Media Session Handler at reference point M5d and by the 5GMS AS at reference point M3d to access resources exposed by the 5GMS AF.

NOTE: While the entirety of the Media Session Handling APIs apply to downlink media streaming, only a subset is applicable to uplink media streaming. Specifically, the Consumption Reporting API is not applicable to uplink media streaming.

### 11.2.1 General

The API used by the Media Session Handler at reference point M5d and by the 5GMS AS at reference point M3d to acquire Service Access Information from the 5GMS AF is specified in clause 9.2 of TS 26.510 [56]. The Service Access Information enables the Media Session Handler and/or 5GMS AS (as applicable) to go on to use the other Media Session Handling APIs specified in clause 11.3 *et seq.*

### 11.4.1 General

The API used by the Media Session Handler at reference point M5u and by the 5GMS AF at reference point M3u to submit metrics reports to the 5GMS AF is specified in clause 9.5 of TS 26.510 [56]. Metrics reports shall be submitted according to the metrics scheme indicated in each client metrics reporting configuration described by the Service Access Information resource (see clause 11.2) at the applicable reference point.

NOTE: Multiple metrics configurations may be active at the same time in the Service Access Information.

- If the metrics scheme urn:‌3GPP:‌ns:‌PSS:‌DASH:‌QM10 is indicated in the client metrics reporting configuration, QoE metrics for DASH-based downlink media streaming shall be reported by the Media Session Handler to the 5GMSd AF at reference point M5d per clause 11.4.3.2.

- If the metrics scheme specified in clause 9.3 of TS 26.118 [42] is indicated in the client metrics reporting configuration, QoE metrics related to Virtual Reality media shall be reported by the Media Session Handler to the 5GMSd AF at reference point M5d per clause 11.4.3.2.

- If one or more of the metrics schemes specified in table 7.8.1‑1 is indicated in the client metrics reporting configurations provided to the 5GMSd AS, QoE metrics reports containing the corresponding class(es) of CMCD information shall be reported by the 5GMSd AS to the 5GMSd AF at reference point M3d per clause 11.4.3.3.

### 11.4.3 Report format

#### 11.4.3.1 General

Metrics reports shall be submitted to the 5GMS AF in a format specified by the metrics reporting scheme in question. The Content-Type HTTP request header shall be set in accordance with the relevant metrics reporting scheme specification.

#### 11.4.3.2 QoE metrics reporting for DASH-based downlink media streaming

For DASH-based downlink media streaming sessions, the following applies when QoE metrics reporting at reference point M5d has been provisioned:

- When the metrics scheme 3GPP urn:‌3GPP:‌ns:‌PSS:‌DASH:‌QM10 is indicated in the client metrics reporting configuration of the Service Access Information at reference point M5d, metrics shall be reported by the Media Session Handler according to the quality reporting scheme specified in clause 10.5 of TS 26.247 [7]. Clauses 10.6.1 and 10.6.2 respectively of TS 26.247 [7] specify the required MIME media type and document format for submitting metrics reports to the 5GMSd AF at reference point M5d.

- When the metrics scheme for Virtual Reality media is indicated in the client metrics reporting configuration of the Service Access Information at reference point M5d, the format of metrics reports submitted to the 5GMSd AF at reference point M5d is further extended as defined in clause 9.4 of TS 26.118 [42].

In both cases, the **ReceptionReport**@clientID attribute should be populated with a GPSI value as defined by TS 23.003 [7], if present and available to the Media Session Handler. Otherwise, this attribute should be represented by a stable and globally unique string.

In both cases, the **QoEReport**@recordingSessionId attribute shall be populated with the media delivery session identifier.

#### 11.4.3.3 Client data reporting

##### 11.4.3.3.1 General

The syntax and MIME media type of metrics reports conveying client data to the 5GMSd AF shall comply with the JSON-based metrics reporting envelope specified in clause 9.4.3.1 of TS 26.510 [56]. The mediaStreaming‌ClientData property (of type ClientData, as specified in table 11.4.3.3.1‑1 below) shall be present in every MetricsSample object contained in this metrics reporting envelope.

Table 11.4.3.3.1‑1: Definition of ClientData data type

| Property name | Type | Cardinality | Description |
| --- | --- | --- | --- |
| requestUrl | AbsoluteUrl | 0..1 | The client request URL to which this client data sample pertains (see NOTE). |
| cmcdSessionInfo | CmcdSessionInfo | 0..1 | CMCD per-session information (see table 11.4.3.3‑2). |
| cmcdObjectInfo | CmcdObjectInfo | 0..1 | CMCD per-request information (see table 11.4.3.3‑3). |
| cmcdRequestInfo | CmcdRequestInfo | 0..1 | CMCD per-object information (see table 11.4.3.3‑4). |
| cmcdStatusInfo | CmcdStatusInfo | 0..1 | CMCD status information (see table 11.4.3.3‑5). |
| NOTE: Data type AbsoluteUrl is specified in TS 26.510 [56]. |

The OpenAPI syntax of the above data types are specified annex C.6.

##### 11.4.3.3.2 Client data reporting for DASH-based downlink media streaming

For DASH-based downlink media streaming sessions, the following applies for the reporting of client data by the 5GMSd AS to the 5GMSd AF at reference point M3d:

- When one or more of the CMCD metrics schemes listed in table 7.8.1‑1 is indicated in client metrics reporting configurations of the Service Access Information provided to the 5GMSd AS at reference point M3d, the syntax and MIME media type of metrics reports conveying CMCD information [CMCDv1] to the 5GMSd AF at reference point M3d shall comply with clause 11.4.3.3.1 above, and at least one of the following properties shall be populated in this ClientData object: cmcdSessionInfo, cmcdObjectInfo, cmcdRequestInfo, cmcdStatusInfo.

NOTE: The syntax of these objects aligns with the *payload definition for JSON transmission* specified in section 3.1 of the CMCD specification [CMCDv1].

 Aligned with section 3.1 of the CMCD specification [CMCDv1], key–value pairs conveyed by these objects should appear in alphabetical order of key name. (This reduces the fingerprinting surface exposed by different sources of client data.)

The OpenAPI syntax of the following data types is specified annex C.6.

Table 11.4.3.3.2‑1: Definition of CmcdSessionInfo data type

| Property name | Type | Cardinality | Description |
| --- | --- | --- | --- |
| v | integer | 0..1 | CMCD specification version.If omitted, version 1 is implied. |
| sid | string | 1..1 | Media delivery session identifier. |
| cid | string | 0..1 | Content identifier. |
| st | CmcdStreamType | 0..1 | Stream type (see table 11.4.3.3.2‑5). |
| sf | CmcdStramingFormat | 0..1 | Streaming format (see table 11.4.3.3.2‑6). |
| pr | number | 0..1 | Playback rate. |

Table 11.4.3.3.2‑2: Definition of CmcdObjectInfo data type

| Property name | Type | Cardinality | Description |
| --- | --- | --- | --- |
| ot | CmcdObjectType | 0..1 | Object type (see table 11.4.3.3.2‑7). |
| d | integer | 0..1 | Object duration expressed in milliseconds. |
| br | integer | 0..1 | Encoded bit rate expressed in kilobits per second. |
| tb | integer | 0..1 | Top bit rate expressed in kilobits per second. |

Table 11.4.3.3.2‑3: Definition of CmcdRequestInfo data type

| Property name | Type | Cardinality | Description |
| --- | --- | --- | --- |
| su | boolean | 0..1 | Start-up. |
| mtp | integer | 0..1 | Measured throughput expressed in kilobits per second. |
| dl | integer | 0..1 | Deadline expressed in milliseconds. |
| bl | integer | 0..1 | Buffer length expressed in milliseconds. |
| nor | RelativeUri | 0..1 | Next object request (see NOTE). |
| nrr | string | 0..1 | Next range request. |
| NOTE: Data type RelativeUri is specified in TS 26.510 [56]. |

Table 11.4.3.3.2‑4: Definition of CmcdStatusInfo data type

| Property name | Type | Cardinality | Description |
| --- | --- | --- | --- |
| rtp | integer | 0..1 | Requested throughput expressed in kilobits per second. |
| bs | boolean | 0..1 | Buffer starvation. |

Table 11.4.3.3.2‑5: Definition of CmcdStreamType enumeration

|  |  |
| --- | --- |
| Enumeration value | Description |
| v | All media segments are available, e.g. Video-on-Demand. |
| l | Media segments become available over time, e.g. live. |

Table 11.4.3.3.2‑6: Definition of CmcdStreamingFormat enumeration

|  |  |
| --- | --- |
| Enumeration value | Description |
| d | MPEG‑DASH [32]. |
| h | HTTP Live Streaming (HLS). |
| s | Smooth Streaming. |
| o | Other. |

Table 11.4.3.3.2‑7: Definition of CmcdObjectType enumeration

|  |  |
| --- | --- |
| Enumeration value | Description |
| m | Text, e.g. manifest or playlist. |
| a | Audio only. |
| v | Video only. |
| av | Multiplexed audio and video. |
| i | Initialisation segment. |
| c | Caption or subtitle. |
| tt | ISO BMFF Timed Text track. |
| k | Cryptographic key, licence or certificate. |
| o | Other. |

Media Player API (M7d/M11d)

### 13.2.4 Configurations and settings API

DASH streaming for a particular downlink media delivery session may be configured by the 5GMSd-Aware Application at reference point M7d or by the Media Session Handler at reference point M11d with the parameters provided in table 13.2.4-1. These parameters may be set, and they may also be observed.

Table 13.2.4-1: Media Player Configuration API

|  |  |  |
| --- | --- | --- |
| Status | Type | Definition |
| sessionId | string | A media delivery session identifier for the downlink media streaming session that has been initialized using the method specified in clause 13.2.3.2. |
| source | Object | Provides the MPD and all contained information. |
| consumptionMode | Enum | Defines two modes:live: in this case the target latency is maintained, if specified in the service description, according to the parametersvod: in this case the latency is set by the application and the latency settings are ignored. |
| maxBufferTime | integer | Maximum buffer time in milliseconds for the service.  |
| serviceDescriptionId | id | Selects a service description by selecting an identifier. |
| serviceDescriptions[] | Service description parameters | Configures a service description as defined in annex K of ISO/IEC 23009-1 [32]. This allows the application to define additional service descriptions beyond those defined in the MPD. |
|  | id | id | Sets a service description identifier different from the ones available in the service descriptions in the MPD or modifies existing service descriptions. |
|  | serviceLatency | Object | Sets service description parameters for the service latency, as defined in table K.1 of ISO/IEC 23009-1 [32]. |
|  | playBackRate | Object | Sets service description parameters for the playback rate, as defined in table K.2 of ISO/IEC 23009-1 [32] when the service is consumed in live mode. |
|  | operatingQuality | Object | Sets service description parameters for the operating quality, as defined in table K.3 of ISO/IEC 23009-1 [32]. |
|  | operatingBandwidth | Object | Sets service description parameters for the operating bandwidth, as defined in table K.4 of ISO/IEC 23009-1 [32]. |
| mediaSettings[] | Media type audio, video, subtitle | Sets the selected Adaptation Set based on the available Adaptation Sets for each media type. |
| metricsConfiguration[ ] | Object | Zero or more sets of settings for collecting metrics in relation to the downlink media streaming session.The key of the array is a metrics reporting scheme identifier URI. |

Table 13.2.4-2: Metrics configuration object

|  |  |  |
| --- | --- | --- |
| Status | Type | Definition |
| inBand‌Transmission‌Mode | Enum | Controls transmission of metrics by the Media Player at reference point M4d:NONE (default value): in-band reporting is disabled.HEADERS: in-band reporting using HTTP request headers.QUERY: in-band reporting using URL query parameters. |

### 13.2.5 Notifications and error events

Table 13.2.5-1 provides a list of notification events that are provided by the Media Player to 5GMSd-Aware Applications at reference point M7d and to the Media Session Handler at reference point M11d. Every notification and error event is disambiguated by a media delivery session identifier.

Table 13.2.5-1: Media Player Notification events

|  |  |  |
| --- | --- | --- |
| Status | Definition | Payload |
| AST\_IN\_FUTURE | Triggered when playback will not start yet as the MPD's availabilityStartTime is in the future. | Media delivery session identifier, Time before playback will start. |
| AVAILABLE\_MEDIA\_CHANGED | The list of available media has changed. | Media delivery session identifier, Media type:- video- audio- subtitle- all |
| BUFFER\_EMPTY | Triggered when the media playback platform's buffer state changes to stalled. | Media delivery session identifier, Media Type |
| BUFFER\_LOADED | Triggered when the media playback platform's buffer state changes to loaded. | Media delivery session identifier, Media Type |
| CAN\_PLAY | Sent when enough data is available that the media can be played. | Media delivery session identifier |
| MANIFEST\_LOADED | Triggered when the manifest load is complete | Media delivery session identifier |
| METRIC\_ADDED | Triggered every time a new metric is added. | Media delivery session identifier |
| METRIC\_CHANGED | Triggered every time a metric value changes. | Media delivery session identifier,Metric identifier |
| METRIC\_UPDATED | Triggered when the configuration of a metric is updated. | Media delivery session identifier,Metric identifier |
| METRICS\_CHANGED | Triggered whenever there is a change to the overall metrics. | Media delivery session identifier |
| OPERATION\_POINT\_CHANGED | Triggered whenever there is a change of a Service Operation Point parameter. | Media delivery session identifier,External reference identifier of currently selected Service Operation Point. |
| PLAYBACK\_ENDED | Sent when media playback completes normally. | Media delivery session identifier |
| PLAYBACK\_ERROR | Sent when an error occurs during media playback. The element's error attribute contains more information. | Media delivery session identifier,Error reason (see table 13.2.5‑2). |
| PLAYBACK\_PAUSED | Sent when media playback is paused. | Media delivery session identifier |
| PLAYBACK\_PLAYING | Sent when the media begins to play (either for the first time, after having been paused, or after ending and then restarting). | Media delivery session identifier |
| PLAYBACK\_SEEKED | Sent when a media playback seek operation completes. | Media delivery session identifier |
| PLAYBACK\_SEEKING | Sent when a media playback seek operation begins. | Media delivery session identifier |
| PLAYBACK\_STALLED | Sent when the media playback platform reports stalled. | Media delivery session identifier |
| PLAYBACK\_STARTED | Sent when playback of the media starts after having been paused; that is, when playback is resumed after a prior pause event. | Media delivery session identifier |
| PLAYBACK\_WAITING | Sent when the media playback has stopped because of a temporary lack of data. | Media delivery session identifier |
| SERVICE\_DESCRIPTION\_SELECTED | sent when the DASH client has selected a service description. | Media delivery session identifier |
| SERVICE\_DESCRIPTION\_CHANGED | Sent when the DASH client has changed a service description. | Media delivery session identifier |
| SERVICE\_DESCRIPTION\_VIOLATED | Provides notification that the service description parameters are currently not met. | Media delivery session identifier,Parameters of service description that are not met |
| SOURCE\_INITIALIZED | Triggered when the source is set up and ready. | Media delivery session identifier |
| DOWNLOAD\_STARTED | Sent when a non-real-time content download begins. | Media delivery session identifier |
| DOWNLOAD\_COMPLETED | Sent when a non-real-time content download is complete. | Media delivery session identifier |
| DOWNLOAD\_ERROR | Send when an error occurs during non-real-time content download | Media delivery session identifier,Error reason (see table 13.2.5‑2). |

Table 13.2.5-2 provides a list of error reasons that are indicated for notifications of type PLAYBACK\_ERROR and DOWNLOAD\_ERROR.

Table 13.2.5-2: Media Player Error reasons

|  |  |
| --- | --- |
| Error reason | Definition |
| ERROR\_MEDIA\_ENTRY\_NOT\_FOUND | The Media Entry Point resource requested by the Media Player could not be located. |
| ERROR\_CONTENT\_NOT\_FOUND | Other content requested by the Media Player could not be located. |
| ERROR\_MEDIA\_PLAYBACK | There is an error from the media playback platform buffer. |
| ERROR\_INVALID\_MEDIA\_ENTRY | The Media Entry Point resource supplied is not syntactically valid. |
| ERROR\_INACCESSIBLE\_MEDIA\_TIME | The media time requested in a seek operation is not accessible in the current media presentation. |
| ERROR\_UNSUPPORTED\_PROFILE | The profile of the media presentation described by the Media Entry Point resource is not supported by the media playback platform. |
| ERROR\_DOWNLOAD\_DEADLINE\_MISSED | The download of content was not completed before the requested deadline and the incomplete download has been discarded. |
| ERROR\_UNSUPPORTED\_‌METRICS\_SCHEME | One of the configured metrics schemes (see table 13.4.2‑1) is not supported by the Media Player. |
| ERROR\_UNSUPPORTED\_‌METRICS\_TRANSMISSION\_MODE | One of the configured metrics transmission modes (see table 13.4.2‑2) is not supported by the Media Player. |

Event Exposure API (R5/R6)

### 18.3.2 QoEMetricsEvent data type

QoEMetricsEvent is a concrete data type describing a set of, or summaries of, QoE metric samples of the same type.

Table 18.3.2‑1: QoEMetricsEvent data type

| Property name | Data Type | Cardinality | Description |
| --- | --- | --- | --- |
| recordType | Event‌Record‌Type | 1..1 | One of the following:- INDIVIDUAL\_SAMPLE- SUMMARY\_MEAN- SUMMARY\_MINIMMUM- SUMMARY\_MAXIMUM- SUMMARY\_SUM |
| recordTimestamp | DateTime | 1..1 | For individual records, the date–time field indicates when the parent QoE metrics report were either generated by the Media Session Handler or initially received by the 5GMS AS.Otherwise, the date–time at which the summary record was generated by the Data Collection AF instantiated in the 5GMS AF. |
| appId | ApplicationId | 1..1 | Identifying the application (see table 5.4.2‑1 of TS 29.571 [12]) to which the UE data carried in this record pertains. |
| provisioningSessionId | Resource‌Id | 0..1 | The identifier of the Provisioning Session to which this record pertains.Present only for individual data sample recordType. |
| session‌Id | Media‌Delivery‌SessionId | 0..1 | A value that uniquely identifies the media streaming session to which this record pertains.Present only for individual data sample recordType. |
| ueIdentification | string | 0..1 | GPSI of the requesting UE or a stable globally unique string identifying the requesting Media Session Handler.Present only for individual data sample recordType and only when exposure is permitted by the data exposure restrictions in force. |
| dataNetworkName | Dnn | 0..1 | Identifying the Data Network of the M4 media streaming session.Present only for individual data sample recordType. |
| sliceId | Snssai | 0..1 | The S-NSSAI identifying the Network Slice of the M4 media streaming session.Present only for individual data sample recordType. |
| ueLocations | array(Location‌Area5G) | 0..1 | The location(s) of the UE when the data described by this record was sampled.Present only for individual data sample recordType and only when exposure is permitted by the data exposure restrictions in force. |
| metric‌Type | Uri | 1..1 | A fully-qualified term identifier that uniquely identifies the QoE metrics reporting scheme and the type of QoE metric included this record, as specified in clause E.2, up to but excluding the first hierarchical separator. For example, urn:‌3GPP:‌ns:‌PSS:‌DASH:‌QM10#AvgThroughput or urn:‌3gpp:‌5gms:‌event-exposure:‌common-media-client-data#session. |
| samples | array(object) | 1..1 | An ordered list of one or more samples of type metricType derived from a single QoE metrics report. |
|  | sampleTimestamp | DateTime | 0..1 | Where applicable for the metric indicated by metricType, the moment in time at which this QoE metric was sampled. |
|  | sampleDuration | Duration | 0..1 | Where applicable for the metric indicated by metricType, the time duration over which this QoE metric was sampled. |
|  | mediaTimestamp | Duration | 0..1 | Where applicable for the metric indicated by metricType, the time point (expressed relative to the start of the media streaming presentation) at which this QoE metric was sampled. |
|  | metrics | array(object) | 1..1 | A set of key–value pairs for the sampled metrics associated with this QoE metric sample. |
|  |  | key | string | 1..1 | A token that uniquely identifies metric subtype within the scope of the QoE metric type. For example: numbytes.There shall be at most one instance of this property's value in the parent array. |
|  |  | value | {} | 0..1 | A value (of any type) associated with the metric indicated by key. |

### 18.3.3 Exposure of client data

#### 18.3.3.1 Exposure of CMCD version 1 information

CMCD version 1 information [CMCDv1] submitted to the 5GMSd AF and passed to the Data Collection AF instantiated in the 5GMS AF shall be packed into QoEMetricsEvent records (see clause 18.3.2) as follows:

- recordTimestamp shall be populated with the timestamp of an HTTP request received by the 5GMS AS at reference point M4d.

- appId shall be populated with the external service identifier of the Provisioning Session.

- sessionId shall be populated with the CMCD session identifier, which is typically the same value as the media delivery session identifier (see clause 6.2.3.6).

- metricType shall be populated with one of the fully-qualified term identifier URIs listed in table E.2.5‑1, indicating the scheme of CMCD information conveyed in this record.

In the case of individual records (recordType set to INDIVIDUAL\_SAMPLE) the samples array shall contain a single entry, corresponding to CMCD information of the class indicated by metricType from a single HTTP request at reference point M4d.

- sampleTimestamp, sampleDuration and mediaTimestamp shall be omitted; the timestamp of all metrics in the record is indicated by recordTimestamp, as specified above.

- The metrics array shall be populated with the set of CMCD keys and values from a single HTTP request at reference point M4d belonging to the class of CMCD information indicated in metricType.

- key shall be one the key names reserved in section 3.3 of the CMCD specification [CMCDv1] for the class of CMCD information indicated in metricType.

 Aligned with section 3.1 of the CMCD specification [CMCDv1], key–value pairs should appear in alphabetical order of key name. (This reduces the fingerprinting surface exposed by different sources of client data.)

- value shall be the value of the key indicated by key. In the case of Boolean keys, value may be omitted, implying the value true.

OpenAPI Syntax

## C.3.0 Maf\_Provisioning API

The normative code specifying the APIs defined in this clause, including JSON Schema representations of HTTP message bodies to be used with these APIs, is published on 3GPP Forge according to the OpenAPI 3.0.0 specification [23]. The YAML files corresponding to this version of the present document shall be published to the following location:

https://forge.3gpp.org/rep/all/5G\_APIs/-/tags/TSG109-Rel19

Informative copies of these YAML files shall be distributed with the present document for convenience only. Where any discrepancy exisits, the version on 3GPP Forge shall be considered definitive.

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26512\_Maf\_Provisioning.yaml".

## C.3A.0 Mas\_Configuration API

The normative code specifying the APIs defined in this clause, including JSON Schema representations of HTTP message bodies to be used with these APIs, is published on 3GPP Forge according to the OpenAPI 3.0.0 specification [23]. The YAML files corresponding to this version of the present document shall be published to the following location:

https://forge.3gpp.org/rep/all/5G\_APIs/-/tags/TSG109-Rel19

Informative copies of these YAML files shall be distributed with the present document for the convenience only. Where any discrepancy exisits, the version on 3GPP Forge shall be considered definitive.

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26512\_Mas\_Configuration.yaml".

## C.4.0 Maf\_SessionHandling API

The normative code specifying the APIs defined in this clause, including JSON Schema representations of HTTP message bodies to be used with these APIs, is published on 3GPP Forge according to the OpenAPI 3.0.0 specification [23]. The YAML files corresponding to this version of the present document shall be published to the following location:

https://forge.3gpp.org/rep/all/5G\_APIs/-/tags/TSG109-Rel19

Informative copies of these YAML files shall be distributed with the present document for convenience only. Where any discrepancy exisits, the version on 3GPP Forge shall be considered definitive.

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26512\_Maf\_SessionHandling.yaml".

# C.6 OpenAPI representation of client data

The normative code specifying the APIs defined in this clause, including JSON Schema representations of HTTP message bodies to be used with these APIs, is published on 3GPP Forge according to the OpenAPI 3.0.0 specification [23]. The YAML files corresponding to this version of the present document shall be published to the following location:

https://forge.3gpp.org/rep/all/5G\_APIs/-/tags/TSG109-Rel19

Informative copies of these YAML files shall be distributed with the present document for convenience only. Where any discrepancy exisits, the version on 3GPP Forge shall be considered definitive.

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26512\_ClientData.yaml".

Controlled Vocabularies for metrics schemes

# E.2 Controlled vocabularies of 5GMS QoE metrics reporting parameters

## E.2.1 Reporting parameters for 3GP-DASH metrics

The name space identifier for the controlled vocabulary of DASH QoE metrics is:

urn:‌3GPP:‌ns:‌PSS:‌DASH:‌QM10

The term identifiers in this controlled vocabulary shall be the set of key names defined in clause 10.2 of TS 26.247 [4], using a single forward slash character ('/') as the hierarchical separator in the resulting path specifier. In the case of metrics lists, the Entry object shall be omitted from the term identifier path.

EXAMPLE 1: urn:‌3GPP:‌ns:‌PSS:‌DASH:‌QM10#AvgThroughput/numbytes

To select all reportable metrics below a common branch of the metrics hierarchy the relevant terminal path element(s) are pruned from the term identifier.

EXAMPLE 2: urn:‌3GPP:‌ns:‌PSS:‌DASH:‌QM10#AvgThroughput

## E.2.2 Reporting parameters for Virtual Reality DASH metrics

The name space identifier for the controlled vocabulary of VR DASH metrics is:

urn:‌3gpp:‌metadata:‌2020:‌VR:‌metrics

The term identifiers in this controlled vocabulary shall be the set of key names defined in clause 9.3 of TS 26.118 [42], using a single forward slash character ('/') as the hierarchical separator in the resulting path specifier. In the case of metrics lists, the Entry object shall be omitted from the term identifier path.

EXAMPLE 1: urn:‌3gpp:‌metadata:‌2020:‌VR:‌metrics#CompQualLatency/Latency

To select all reportable metrics below a common branch of the metrics hierarchy the relevant terminal path element(s) are pruned from the term identifier.

EXAMPLE 2: urn:‌3gpp:‌metadata:‌2020:‌VR:‌metrics#CompQualLatency

## E.2.3 Reporting parameters for 5GMS delivery over eMBMS

The controlled vocabularies specified in clauses E.2.1 and/or E.2.2 (as applicable) shall be used to identify metrics or groups of metrics in relation to reporting the QoE of 5GMS delivery over eMBMS.

## E.2.4 Reporting parameters for 5GMS delivery over MBS

Metrics reporting for MBS User Services is not specified by TS 26.517 [64] in this release.

## E.2.5 Reporting parameters for CMCD-based client data

The name space identifier for the controlled vocabulary of CMCD-based client data is:

urn:3gpp:5gms:event-exposure:common-media-client-data

The term identifiers in this controlled vocabulary are arranged in a two-level hierarchy, the two levels being delimited by a single forward slash character ('/') as the hierarchical separator in the resulting path specifier. The first path element of the term identifier shall indicate the class of CMCD information as specified in table E.2.3‑1 below.

Table E.2.3‑1: Term identifiers for CMCD information exposure

|  |  |  |
| --- | --- | --- |
| CMCD information scheme | Term identifier | Fully-qualified term identifier |
| CMCD per-session information | session | urn:3gpp:5gms:event-exposure:common-media-client-data#session |
| CMCD per-object information | object | urn:3gpp:5gms:event-exposure:common-media-client-data#object |
| CMCD per-request information | request | urn:3gpp:5gms:event-exposure:common-media-client-data#request |
| CMCD status information | status | urn:3gpp:5gms:event-exposure:common-media-client-data#status |

The second path element shall indicate one the key names reserved in section 3.3 of the CMCD specification [CMCDv1] for the class of CMCD information indicated by the first path element.

EXAMPLE 1: urn:3gpp:5gms:event-exposure:common-media-client-data#session/pr (current playback rate)

EXAMPLE 2: urn:3gpp:5gms:event-exposure:common-media-client-data#request/mtp (measured throughput)

End of changes