**3GPP TSG-SA WG4 Meeting #1231-bis-e S4-250421**

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Title: Wire formats for CMCD reporting and event exposure

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Document for: Discussion and agreement

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# Abstract

The feasibility study FS\_AMD recommended reusing the existing 5GMS QoE metrics reporting mechanism at reference point M3d to support the reporting of Common Media Client Data (CMCD) – as specified by the CTA-sponsored WAVE project in CTA-5004 [1] – to the 5GMS AF.

This paper examines how to achieve this in practice, as well as assessing the feasibility of reusing the existing event exposure mechanism for QoE metrics as specified in TS 26.512 [2] to expose the CMCD information to downstream event consumers such as the NWDAF.

# Introduction



Having received CMCD information in band with media requests at reference point M4d, it is agreed in clause 5.16.7 of TR 26.804 [3] that the 5GMS AS will use the existing QoE metrics reporting mechanism at reference point M3d to submit metrics reports (following a new JSON-based format) to the 5GMSd AF according to a metrics reporting configuration previously obtained from Service Access Information requested from the 5GMSd AF, also at reference point M3d.

The CMCD information received by the 5GMSd AF is extracted from these QoE metrics reports and may be used to influence the behaviour of the relevant media delivery session in the 5GMS System.

The CMCD information is also passed to the Data Collection AF, if instantiated in the 5GMSd AF, for exposure to the NWDAF via reference point R5 and/or to Event Consumers via R6. This paper investigates whether the existing event exposure data structures for QoE metrics are suitable for reuse in this context. Reusing these data structures would eliminate the need to specify new ones in TS 26.512 [2] as well as in downstream CT technical specifications.

## Approach A: Four different metrics schemes

In this approach, CMCD information is treated as four different metrics schemes when provisioned at reference point M1d, corresponding to the four different HTTP request headers used for reporting CMCD information at reference point M4d, but is not intended to signal the use of HTTP request headers rather than URL query parameters at that reference point:

|  |  |
| --- | --- |
| Metrics scheme | Metrics scheme URI |
| CMCD per-session information | urn:3gpp:5gms:event-exposure:common-media-client-data:session |
| CMCD per-object information | urn:3gpp:5gms:event-exposure:common-media-client-data:object |
| CMCD per-request information | urn:3gpp:5gms:event-exposure:common-media-client-data:request |
| CMCD status information | urn:3gpp:5gms:event-exposure:common-media-client-data:status |

The advantage of this approach is that a 5GMS Application Provider can provision only a subset of the different schemes using metrics reporting configurations. The **frequency of reporting** (at reference point M3) and/or **exposure** (at R5/R6) of the different schemes can also be provisioned independently at reference points M1d, M3d and M5d, and the Media Stream Handler is configured at M11d to report accordingly at M4d.

## Approach B: Single metrics scheme

In this approach, all CMCD information is treated as a single metrics scheme when provisioned at reference point M1d:

|  |  |
| --- | --- |
| Metrics scheme | Metrics scheme URI |
| CMCD information | urn:3gpp:5gms:event-exposure:common-media-client-data |

The advantage of this approach is simplicity at the expense of finer-grained configurability.

# Examples

## QoE metrics reporting at reference point M3

This section proposes a new **JSON-based reporting envelope** format supporting both Approach A and Approach B above.

The following example shows a single QoE metrics report that conveys five metrics samples: three containing per-session metrics; the other two containing per-request metrics. **The JSON formatting of the individual CMCD metrics is fully compliant with CTA-5004 [1].**

Since CMCD keys describe data at exactly one scope (session, request, object), a different object type is specified for each of these that contains only the relevant keys. All keys are optional to report.

The data types are designed to be generic, so that the same MetricsReport envelope could be reused to convey non-CMCD information in the future.

Example QoE metrics report for CMCD at reference point M3d

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Data type | | | | Example | Remarks |
| MetricsReport | | | | { |  |
|  |  | | | "reportTimestamp": "2025-03-21T10:40:00Z", |  |
|  | | | "sessions": [ |  |
| MetricsSession | | | { |  |
|  |  |  | "sessionId": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e", |  |
|  |  | "clientId": "447777123456", | GPSI, etc. |
|  |  | "externalServiceId": "uk.co.bbc.iplayer", | Reverse FQDN |
|  |  | "samples": [ |  |
| MetricsSample | | { |  |
|  |  | "sampleTimestamp": "2025-03-21T10:30:04", |  |
| CmcdSessionData | "cmcdSessionData": { |  |
| "cid": "p0jq4wk0", | Content ID |
| "pr": "1.0", | Playback rate |
| "sf": "d", | DASH |
| "sid": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e", | Session ID |
| "st": "l", | Stream type |
| "v": "1" | CMCD v1 |
| }, |  |
| CmcdRequestData | "cmcdRequestData": { |  |
| "bl": "200", | Buffer length |
| "mtp": "1257", | Throughput |
| "nor": "video/segment0002.mp4" | Next object |
| } |  |
| }, |  |
| MetricsSample | | { |  |
|  |  | "sampleTimestamp": "2025-03-21T10:30:05", |  |
| CmcdRequestData | "cmcdRequestData": { |  |
| "bl": "300", | Buffer length |
| "mtp": "1253", | Throughput |
| "nor": "video/segment0002.mp4" | Next object |
| } |  |
| }, |  |
| MetricsSample | | { |  |
|  |  | "sampleTimestamp": "2025-03-21T10:30:14", |  |
| CmcdSessionData | "cmcdSessionData": { |  |
| "cid": "p0jq4wk0", | Content ID |
| "pr": "2.0", | Playback rate |
| "sf": "d", | DASH |
| "sid": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e", | Session ID |
| "st": "l", | Stream type |
| "v": "1" | CMCD v1 |
| } |  |
|  | }, |  |
| MetricsSample | | { |  |
|  |  | "sampleTimestamp": "2025-03-21T10:30:20", |  |
| CmcdSessionData | "cmcdSessionData": { |  |
| "cid": "p0jq4wk0", | Content ID |
| "pr": "1.0", | Playback rate |
| "sf": "d", | DASH |
| "sid": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e", | Session ID |
| "st": "l", | Stream type |
| "v": "1" | CMCD v1 |
| } |  |
|  |  | } |  |
|  |  | ] |  |
|  |  | } |  |
|  |  |  | ] |  |
|  |  |  | } |  |

## Event exposure to event consumers

Information is exposed to event consumers as a series of **events** carrying **time series** data. For this reason, CMCD information needs to be assembled into a coherent timeline by the Data Collection AF prior to exposure.

In the below example, the CMCD information at the start of a media streaming session is packed in to a single AfEventNotification (of type MS\_QOE\_METRICS), which contains a single QoEMetricsCollection object. There are two events present in this collection:

* A QoEMetricsEvent object conveying a time series of CMCD Session metrics.
* A QoEMetricsEvent object conveying a time series of CMCD Request metrics.

Note that the JSON format of the CMCD key–value pairs is *not* compliant with section 2.3 of CTA-5004 because it reuses the existing notification envelope format specified in TS 29.517 [4] and TS 26.512 [2] that is intended for consumption by the NWDAF and other event consumer subscribers.

Note also:

1. The optional mediaTimestamp property of QoEMetricsEvent cannot be populated from CMCD information, and is therefore omitted.
2. The optional sampleDuration property of QoEMetricsEvent is also omitted; CMCD information is considered instantaneous sample provided at the time of the M4d request.

Example QoE metrics event for CMCD exposed to event consumers (Approach A)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | Remarks |
| AfEventExposureNotif | | | | | { |  |
|  |  | | | | "notifId": "0913937b-9fa9-4435-8c49-8d14bf4519b2", |  |
|  |  | | | | "eventNotifs": [ |  |
|  | AfEventNotification | | | | { |  |
|  |  |  | | | "event": "MS\_QOE\_METRICS", |  |
|  |  |  | | | "timeStamp": "2025-03-21T10:44:36Z", |  |
|  |  |  | | | "msQoeMetrics" : [ |  |
|  |  | QoEMetricsCollection | | | { |  |
|  |  |  |  | | "collectionTimestamp": "2025-03-21T10:40:00Z", |  |
|  |  |  |  | | "startTimestamp": "2025-03-21T10:30:00Z", |  |
|  |  |  |  | | "endTimestamp": "2025-03-21T10:39:59Z", |  |
|  |  |  |  | | "sampleCount": "2", | Number of event records? |
|  |  |  |  | | "streamingDirection": "MS\_DOWNLINK", |  |
|  |  |  |  | | "summarisations": "NONE", |  |
|  |  |  |  | | "records": [ |  |
|  |  |  | QoEMetricsEvent | | { |  |
|  |  |  |  |  | "recordType": "INDIVIDUAL\_SAMPLE", |  |
|  |  |  |  |  | "recordTimestamp": "2025-03-21T10:30:04", |  |
|  |  |  |  |  | "appId": "uk.co.bbc.iplayer.android", |  |
|  |  |  |  |  | "provisioningSessionId": "300ffa46-2b5d-441c-9766-9a6432c170c6", | Populated by reverse lookup of appId. |
|  |  |  |  |  | "sessionId": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e", | Media delivery session ID |
|  |  |  |  |  | "ueIdentification": "447777123456", | GPSI, etc. |
|  |  |  |  |  | "dataNetworkName": "TS23.003clause9A", | Populated by reverse lookup in PCF, if possible. |
|  |  |  |  |  | "sliceId": {"sst": "128", "sd": "abcdef"}, |
|  |  |  |  |  | "ueLocations": [ |
|  |  |  |  | LocationArea5G | { |
|  |  |  |  |  | "civicAddresses": [ |
|  |  |  |  |  | {"country": "GBR"} |
|  |  |  |  |  | } |
|  |  |  |  |  | ], |
|  |  |  |  |  | "metricType": "urn:3gpp:5gms:event-exposure:common-media-client-data:session", |  |
|  |  |  |  |  | "samples" : [ |  |
|  |  |  |  |  | { |  |
|  |  |  |  |  | "sampleTimestamp": "2025-03-21T10:30:04", |  |
|  |  |  |  |  | "mediaTimestamp": "PT0S", |  |
|  |  |  |  |  | "metrics": [ |  |
|  |  |  |  |  | { "key": "cid", "value": "p0jq4wk0" }, |  |
|  |  |  |  |  | { "key": "pr", "value": "1.0" }, | Playing |
|  |  |  |  |  | { "key": "sf", "value": "d" }, |  |
|  |  |  |  |  | { "key": "sid", "value": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e" }, |  |
|  |  |  |  |  | { "key": "st", "value": "l" }, |  |
|  |  |  |  |  | { "key": "v", "value": "l" } | CMCD v1 |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | }, |  |
|  |  |  |  |  | { |  |
|  |  |  |  |  | "sampleTimestamp": "2025-03-21T10:30:14", |  |
|  |  |  |  |  | "mediaTimestamp": "PT0S", |  |
|  |  |  |  |  | "metrics": [ |  |
|  |  |  |  |  | { "key": "cid", "value": "p0jq4wk0" }, |  |
|  |  |  |  |  | { "key": "pr", "value": "2.0" }, | Seeking |
|  |  |  |  |  | { "key": "sf", "value": "d" }, |  |
|  |  |  |  |  | { "key": "sid", "value": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e" }, |  |
|  |  |  |  |  | { "key": "st", "value": "l" }, |  |
|  |  |  |  |  | { "key": "v", "value": "l" } | CMCD v1 |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | }, |  |
|  |  |  |  |  | { |  |
|  |  |  |  |  | "sampleTimestamp": "2025-03-21T10:30:20", |  |
|  |  |  |  |  | "mediaTimestamp": "PT7M14S", |  |
|  |  |  |  |  | "metrics": [ |  |
|  |  |  |  |  | { "key": "cid", "value": "p0jq4wk0" }, |  |
|  |  |  |  |  | { "key": "pr", "value": "1.0" }, | Playing |
|  |  |  |  |  | { "key": "sf", "value": "d" }, |  |
|  |  |  |  |  | { "key": "sid", "value": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e" }, |  |
|  |  |  |  |  | { "key": "st", "value": "l" }, |  |
|  |  |  |  |  | { "key": "v", "value": "l" } | CMCD v1 |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | }, |  |
|  |  |  | QoEMetricsEvent | | { |  |
|  |  |  |  |  | "recordType": "INDIVIDUAL\_SAMPLE", |  |
|  |  |  |  |  | "recordTimestamp": "2025-03-21T10:30:04", |  |
|  |  |  |  |  | "appId": "uk.co.bbc.iplayer.android", |  |
|  |  |  |  |  | "provisioningSessionId": "300ffa46-2b5d-441c-9766-9a6432c170c6", |  |
|  |  |  |  |  | "sessionId": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e", |  |
|  |  |  |  |  | "ueIdentification": "447777123456", |  |
|  |  |  |  |  | "dataNetworkName": "TS23.003clause9A", |  |
|  |  |  |  |  | "sliceId": {"sst": "128", "sd": "abcdef"}, |  |
|  |  |  |  |  | "ueLocations": { |  |
|  |  |  |  |  | { |  |
|  |  |  |  |  | "civicAddresses": [ |  |
|  |  |  |  |  | {"country": "GBR"} |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |
|  |  |  |  |  | ], |  |
|  |  |  |  |  | "metricType": "urn:3gpp:5gms:event-exposure:common-media-client-data:request", |  |
|  |  |  |  |  | "samples" : [ |  |
|  |  |  |  |  | { |  |
|  |  |  |  |  | "sampleTimestamp": "2025-03-21T10:30:04", |  |
|  |  |  |  |  | "sampleDuration": "PT1S", |  |
|  |  |  |  |  | "mediaTimestamp": "PT0S", |  |
|  |  |  |  |  | "metrics": [ |  |
|  |  |  |  |  | { "key": "bl", "value": "200" }, |  |
|  |  |  |  |  | { "key": "mtp", "value": "1257" }, |  |
|  |  |  |  |  | { "key": "nor", "value": "video/segment0002.mp4" } |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | }, |  |
|  |  |  |  |  | { |  |
|  |  |  |  |  | "sampleTimestamp": "2025-03-21T10:30:05", |  |
|  |  |  |  |  | "sampleDuration": "PT1S", |  |
|  |  |  |  |  | "mediaTimestamp": "PT1S", |  |
|  |  |  |  |  | "metrics": [ |  |
|  |  |  |  |  | { "key": "bl", "value": "300" }, |  |
|  |  |  |  |  | { "key": "mtp", "value": "1253" }, |  |
|  |  |  |  |  | { "key": "nor", "value": "video/segment0002.mp4" } |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |

With Approach B, all metrics belong to the same namespace (urn:3gpp:5gms:event-exposure:common-media-client-data), so the metrics samples can be packed more efficiently into the same enclosing QoEMetricsEvent record. However, the key name of each metric is more verbose to reflect its scope.

Example QoE metrics event for CMCD exposed to event consumers (Approach B)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  | Remarks |
| AfEventExposureNotif | | | | | { |  |
|  |  | | | | "notifId": "0913937b-9fa9-4435-8c49-8d14bf4519b2", |  |
|  |  | | | | "eventNotifs": [ |  |
|  | AfEventNotification | | | | { |  |
|  |  |  | | | "event": "MS\_QOE\_METRICS", |  |
|  |  |  | | | "timeStamp": "2025-03-21T10:44:36Z", |  |
|  |  |  | | | "msQoeMetrics" : [ |  |
|  |  | QoEMetricsCollection | | | { |  |
|  |  |  |  | | "collectionTimestamp": "2025-03-21T10:40:00Z", |  |
|  |  |  |  | | "startTimestamp": "2025-03-21T10:30:00Z", |  |
|  |  |  |  | | "endTimestamp": "2025-03-21T10:39:59Z", |  |
|  |  |  |  | | "sampleCount": "1", | Number of event records? |
|  |  |  |  | | "streamingDirection": "MS\_DOWNLINK", |  |
|  |  |  |  | | "summarisations": "NONE", |  |
|  |  |  |  | | "records": [ |  |
|  |  |  | QoEMetricsEvent | | { |  |
|  |  |  |  |  | "recordType": "INDIVIDUAL\_SAMPLE", |  |
|  |  |  |  |  | "recordTimestamp": "2025-03-21T10:30:04", |  |
|  |  |  |  |  | "appId": "uk.co.bbc.iplayer.android", | Populated by reverse lookup in Provisioning Session |
|  |  |  |  |  | "provisioningSessionId": "uk.co.bbc.iplayer", |  |
|  |  |  |  |  | "sessionId": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e", |  |
|  |  |  |  |  | "ueIdentification": "447777123456", | Populated by reverse lookup in PCF. |
|  |  |  |  |  | "dataNetworkName": "TS23.003clause9A", |
|  |  |  |  |  | "sliceId": {"sst": "128", "sd": "abcdef"}, |
|  |  |  |  |  | "ueLocations": [ |
|  |  |  |  | LocationArea5G | { |
|  |  |  |  |  | "civicAddresses": [ |
|  |  |  |  |  | {"country": "GBR"} |
|  |  |  |  |  | } |
|  |  |  |  |  | ], |
|  |  |  |  |  | "metricType": "urn:3gpp:5gms:event-exposure:common-media-client-data", |  |
|  |  |  |  |  | "samples" : [ |  |
|  |  |  |  |  | { |  |
|  |  |  |  |  | "sampleTimestamp": "2025-03-21T10:30:04", |  |
|  |  |  |  |  | "mediaTimestamp": "PT0S", |  |
|  |  |  |  |  | "metrics": [ |  |
|  |  |  |  |  | { "key": "session/cid", "value": "p0jq4wk0" }, |  |
|  |  |  |  |  | { "key": "session/pr", "value": "1.0" }, | Playing |
|  |  |  |  |  | { "key": "session/sf", "value": "d" }, |  |
|  |  |  |  |  | { "key": "session/sid", "value": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e" }, |  |
|  |  |  |  |  | { "key": "session/st", "value": "l" }, |  |
|  |  |  |  |  | { "key": "session/v", "value": "l" } | CMCD v1 |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | }, |  |
|  |  |  |  |  | { |  |
|  |  |  |  |  | "sampleTimestamp": "2025-03-21T10:30:14", |  |
|  |  |  |  |  | "mediaTimestamp": "PT0S", |  |
|  |  |  |  |  | "metrics": [ |  |
|  |  |  |  |  | { "key": "session/cid", "value": "p0jq4wk0" }, |  |
|  |  |  |  |  | { "key": "session/pr", "value": "2.0" }, | Seeking |
|  |  |  |  |  | { "key": "session/sf", "value": "d" }, |  |
|  |  |  |  |  | { "key": "session/sid", "value": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e" }, |  |
|  |  |  |  |  | { "key": "session/st", "value": "l" }, |  |
|  |  |  |  |  | { "key": "session/v", "value": "l" } | CMCD v1 |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | }, |  |
|  |  |  |  |  | { |  |
|  |  |  |  |  | "sampleTimestamp": "2025-03-21T10:30:20", |  |
|  |  |  |  |  | "mediaTimestamp": "PT7M14S", |  |
|  |  |  |  |  | "metrics": [ |  |
|  |  |  |  |  | { "key": "session/cid", "value": "p0jq4wk0" }, |  |
|  |  |  |  |  | { "key": "session/pr", "value": "1.0" }, | Playing |
|  |  |  |  |  | { "key": "session/sf", "value": "d" }, |  |
|  |  |  |  |  | { "key": "session/sid", "value": "4e730c95-df38-4ad0-9a0b-ece2217cbd3e" }, |  |
|  |  |  |  |  | { "key": "session/st", "value": "l" }, |  |
|  |  |  |  |  | { "key": "session/v", "value": "l" } | CMCD v1 |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | }, |  |
|  |  |  |  |  | { |  |
|  |  |  |  |  | "sampleTimestamp": "2025-03-21T10:30:04", |  |
|  |  |  |  |  | "sampleDuration": "PT1S", |  |
|  |  |  |  |  | "mediaTimestamp": "PT0S", |  |
|  |  |  |  |  | "metrics": [ |  |
|  |  |  |  |  | { "key": "request/bl", "value": "200" }, | Buffer length |
|  |  |  |  |  | { "key": "request/mtp", "value": "1257" }, | Throughput |
|  |  |  |  |  | { "key": "request/nor", "value": "video/segment0002.mp4" } | Next object |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | }, |  |
|  |  |  |  |  | { |  |
|  |  |  |  |  | "sampleTimestamp": "2025-03-21T10:30:05", |  |
|  |  |  |  |  | "sampleDuration": "PT1S", |  |
|  |  |  |  |  | "mediaTimestamp": "PT1S", |  |
|  |  |  |  |  | "metrics": [ |  |
|  |  |  |  |  | { "key": "request/bl", "value": "300" }, | Buffer length |
|  |  |  |  |  | { "key": "request/mtp", "value": "1253" }, | Throughput |
|  |  |  |  |  | { "key": "request/nor", "value": "video/segment0002.mp4" } | Next object |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |
|  |  |  |  |  | ] |  |
|  |  |  |  |  | } |  |

# Proposal

It is proposed that SA4 agrees to specify the following in TS 26.512 [2]:

1. In a new clause E.2.3, four new metrics schemes for reporting CMCD information based on **Approach A**, as described in section 2.1.
2. In a new clause 17B and C.5.3, a **JSON-based QoE metrics reporting envelope** with a syntax similar to that shown in section 3.1, to be used in the first instance to convey CMCD information at reference point M3d.
   * *This would potentially be better specified instead in a new clause 12 to TS 26.510 [5] so that it can be used more generally by other media delivery systems, such as RTC. In this case, the YAML syntax of the top-level elements are instead added to TS26510\_‌Maf\_SessionHandling\_‌MetricsReporting.yaml.*
3. In a new annex, register a MIME content type for the new JSON-based QoE metrics reporting envelope, e.g. *application/3gpp-media-delivery-qoe-report+json*.
   * *Again, this would potentially be better specified instead in a new annex to TS 26.510 [5] so that it can be used more generally by other media delivery systems, such as RTC.*
4. In clause 4.5, stage-3 procedures used by the 5GMS AS to obtain a client metrics reporting configuration in Service Access Information retrieved from the 5GMS AF at reference point M3d (similar to clause 4.7.5).
5. In clause 4.5, stage-3 procedures used by the 5GMS AS to submit metrics reports to the 5GMS AF at reference point M3d using the new JSON-based envelope (similar to clause 4.7.2).
6. In clauses 9.4 and 9.5, extend the Content Hosting Configuration and Content Publishing Configuration data models (used to configure the 5GMS AS at reference point M3d/M3u respectively) to include the **external service identifier** of the parent Provisioning Session so that this value can be included in QoE metrics reports using the new JSON-based QoE metrics reporting envelope.
7. Generalisation of the applicability of the **Media Session Handling API** in clause 11 to cover usage by the 5GMS AS at reference point M3 (in addition to the existing usage by the Media Session Handler at M5).
8. In clause 11.4.1, details of the three new metrics schemes.
9. In clause 11.4.3, details of the new JSON-based metrics reporting envelope.
10. In clause 18.3, instructions on how to pack CMCD information into the existing ***QoEMetricsEvent* record data type**, for inclusion in a *QoEMetricsCollection*.

# References

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

[2] 3GPP TS 26.512: "5G Media Streaming (5GMS); Protocols".

[3] 3GPP TR 26.804: "Study on 5G media streaming extensions", Release 19.

[4] 3GPP TR 26.517: "5G System; Application Function Event Exposure Service; Stage 3".

[5] 3GPP TS 26.510: "Media delivery; interactions and APIs for provisioning and media session handling".