**3GPP TSG-S4 Meeting #131-bis-e*****S4-250505***

**Electronic Meeting, 11th–17th April 2025**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **26.512** | **CR** | **0087** | **rev** | **-** | **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)*.* | | | | | | | | |
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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:*** | , BBC | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | TR 26804 clause 7.3.3 describes recommendations for normative specification arising from version 19 for stage-3. This contribution implements those recommendations on topic of multi-access media delivery | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Below is the summary of changes to extend the media stream handling API between the 5GMS-aware application/Media Session Handler and the Media Stream Handler:   * Changes to the Configuration Settings API to enable configuration of multipath delivery configuration * Changes to the Dynamic Status Information API to allow for status information exchange about multi-access connection | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Multi-access media delivery feature is incomplete | | | | | | | | |
| ***Q*** | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.9, 4.9.3, 12.4, 13.2.4, 13.2.5, 13.2.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | |  | **X** | Test specifications | | | |  | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | S4-250505: Version implementing normative recommendations documented in clause 7.3.3 on topic of multi-access media delivery | | | | | | | | |

FIRST CHANGE

## 4.9 Procedures of the M7d/M11d (UE Media Player) interface

Next CHANGE

### 4.9.3 Multi-access media delivery procedures

The Media Player may use multiple access networks available on the UE to connect to a remote service location/endpoint to send or receive media data over reference point M4. To facilitate multi-access delivery, the 5GMS-Aware Application and the Media Session Handler may configure multi-access delivery parameters at the Media Player via reference point M7 and M11 respectively. The multi-access delivery parameters are described in clause 13.2.4 of the present document.

The Media Player may inform the 5GMS-Aware Application and the Media Session Handler via reference point M7 and M11 respectively about the status of the multi-access delivery connection over reference point M4 as described in clauses 13.2.5 and 13.2.6 of the present document. The 5GMS-Aware Application and the Media Session Handler may make use of this information, for example for re-configuration of multi-access delivery connection properties, or disabling multi-access delivery.

Next CHANGE

## 12.4 3GPP Service URL for 5G Media Streaming

The 3GPP Service URL for 5G Media Streaming is based on the generic 3GPP Service URL defined in clause 6 of TS 26.510 [56].

If the service type discriminator service in the URL indicates ms, then the target service is a 5G Media Streaming service.

The parameters of the 3GPP Service URL for 5G Media Streaming are defined in table 12.4-1.

Table 12.4-1: 3GPP Service URL parameters for 5G Media Streaming

|  |  |  |
| --- | --- | --- |
| Path element | Cardinality | Description |
| service\_id | 1 | An External Service Identifier that resolves to a Provisioning Session in the 5GMS System. |
| Query parameter | Cardinality | Description |
| af-host-address | 0..\* | The Fully Qualified Domain Name and optional port number of a 5GMS AF endpoint to be used by the Media Session Handler at reference point M5 with the format hostname[:port].  More than one occurrence of this parameter may be present in the Service URL to indicate alternative host endpoint addresses. Any of these may be used by the Media Session Handler at reference point M5.  Supplied by the invoking 5GMS-Aware Application when the 5GMS AF is deployed in an External DN. The endpoint address(es) may, for example, have been passed to the 5GMS-Aware Application via reference point M8.  If omitted, the Media Session Handler assumes the default 5GMS AF host endpoint address ms.af.3gppservices.org:443 is to be used at reference point M5. |
| access-token | 0..1 | A token that is presented by the Media Session Handler to the 5GMS AF at reference point M5 that asserts its right to invoke the media session handling operations exposed by the 5GMS AF. |
| service-operation-point | 0..1 | A reference to the target Service Operation Point of the 5G Media Streaming session.  Overrides any default Service Operation Point signalled in the resource pointed to by media-entry-point. |
| estimated-volume | 0..1 | An estimate of the volume of media data to be transferred between the 5GMS Client and the 5GMS AS at reference point M4 during the 5G Media Streaming session.  Required if service-operation-point or media-entry-point refers to a Policy Template with an associated Background Data Transfer policy. |
| media-entry-point | 0..1 | A Media Entry Point reference expressed as a fully qualified URL per RFC 3986 [41], suitable for presentation to a Media AS at reference point M4.  If supplied, used by the Media Session Handler to launch the Media Stream Handler (Media Player or Media Streamer) after successfully initiating media session handling. |
| content-type | 0..\* | A MIME content type string conforming to section 5 of RFC 2045 [57] identifying a type of Media Entry Point that is acceptable to the Media Stream Handler (Media Player or Media Streamer).  More than one occurrence of this parameter may be present in the Service URL to indicate that more than one type of Media Entry Point is acceptable.  Used by the Media Session Handler to eliminate unacceptable Media Entry Points from those listed in the Service Access Information.  It is an error to supply this parameter if an explicit Media Entry Point is specified using media-entry-point. |
| profile | 0..\* | A fully-qualified term identifier from a controlled vocabulary specified outside the scope of the present document identifying a profile of Media Entry Point that is acceptable to the Media Stream Handler (Media Player or Media Streamer). The term identifier shall be formatted as a URI according to RFC 3986 [41].  More than one occurrence of this parameter may be present in the Service URL to indicate that more than one type of Media Entry Point is acceptable.  Used by the Media Session Handler to eliminate unacceptable Media Entry Points from those listed in the Service Access Information.  It is an error to supply this parameter if an explicit Media Entry Point is specified using media-entry-point. |

The service\_id path element, and the af-host-address and access-token query parameters correspond to the baseline Service Access Information for downlink media streaming specified in clause 4.2.3 of TS 26.501 [2] and the baseline parameters of the 3GPP Service URL for 5G Media Streaming defined in clause 4.10.2 of [2]. Together, they enable a full set of Service Access Information to be retrieved by the Media Session Handler from the 5GMS AF using the Service Access Information API at reference point M5 specified in clause 11.2 of the present document.

The service-operation-point parameter is used to support the procedure where the desired Service Operation Point is known *a priori* to the invoker and/or is not encoded in the Media Entry Point.

The estimated-volume parameter is used to support the procedure where the invoker intends the launched 5G Media Streaming session to be used for the purpose of Background Data Transfer.

The media-entry-point query parameter is used to support the procedure where the Media Session Handler launches media playback in the Media Stream Handler (Media Player or Media Streamer) after successfully retrieving a full set of Service Access Information via reference point M5 (if needed) and after successfully initiating media session handling.

The remaining query parameters are used for client-side filtering of Media Entry Point information provided in the Service Access Information and selection of one Media Entry Point by the Media Session Handler. (They are mutually exclusive with the media-entry-point parameter.) In this case, media playback by the Media Stream Handler (Media Player or Media Streamer) is launched by the Media Session Handler with its chosen Media Entry Point.

If the 5GMS-Aware Application prefers to launch media streaming itself (rather than have the Media Session Handler launch media streaming on its behalf), the media-entry-point query parameter and all client-side filtering parameters shall be omitted from the 3GPP Service URL. In this case, the Media Session Handler initiates only media session handling for the 5GMS Provisioning Session identified by the External Service Identifier.

Next CHANGE

### 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. Note that 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 initialised 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 parameters  vod: 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. |
| multipathTransportProtocols | | | array(enum) | Multipath transport protocol (MPTCP and/or MPQUIC) to be used for media delivery at reference point M4. If empty, multipath delivery is disabled. |
| pathsForMultipathDelivery | | |  | Number of paths used by the Media Player for multipath delivery connection to a target service location/endpoint at reference point M4:  - In case of MPTCP-based multipath delivery, this parameter represents the number of MPTCP subflows.  - In case of MPQUIC-based multipath delivery, this parameter represents the number of MPQUIC paths.  If both the minimum and maximum number of paths for the multipath delivery connection below are set to zero, multipath operation is disabled for that service location/endpoint. |
|  | min | | Integer | Minimum number of MPTCP subflows or MPQUIC paths used by the Media Player for multipath delivery at reference point M4. |
|  | max | | Integer | Maximum number of MPTCP subflows or MPQUIC paths used by the Media Player for multipath delivery at reference point M4. |
| addressesForMultipathConnection | | |  | The number of addresses to be learned over Multipath TCP connection |
|  | min | | Integer | Minimum number of addresses that are to be learned over the Multipath TCP connection |
|  | max | | Integer | Maximum number of addresses that are to be learned over the Multipath TCP connection |
| multipathConfigurationOptions | | |  | Configuration options for all interfaces in the multipath delivery connection |
|  | interfaceConfigurationOptions | | Array of Objects | Configuration options for an interface in the multipath delivery connection |
|  |  | interfaceIdentifier | string | Identifier of the interface |
|  |  | pathIdentifier | string | If this is included, the multipath path manager creates a MPTCP subflow or MPQUIC path over this interface. |
|  |  | backup | boolean | Indicates whether the interface serves as a backup interface. |

Next CHANGE

### 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). |
| MULTI-ACCESS\_DELIVLERY\_ESTABLISHED | Triggered when multi-access delivery connection is setup and ready | Media delivery session identifier |
| MULTI-ACCESS\_DELIVERY\_TOREDOWN | Triggered when multi-access delivery CONNECTION is tore down | Media delivery session identifier |

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 did not complete before the requested deadline and the incomplete download has been discarded. |
| ERROR\_MULTI-ACCESS\_DELIVERY\_DENIED | The request for multi-access delivery was denied. |

Next CHANGE

### 13.2.6 Dynamic Status Information

Table 13.2.6-1 provides a list of dynamically changing status information that can be obtained from the Media Player via reference point M7d or M11d. A separate set of Dynamic Status Information is provided for each active downlink media streaming session, indexed by its media delivery session identifier initialised per clause 13.2.3.2.

Table 13.2.6-1: Media Player Dynamic Status information

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Status | | | | Type | Parameter | Definition |
| state | | | | Enumeration |  | An enumerated value from table 13.2.2‑1 indicating the current state of the Media Player. |
| averageThroughput | | | | float | none | Current average throughput computed in the ABR logic in bit/s. |
| bufferLength | | | | float | MediaType  "video", "audio" and "subtitle" | Current length of the buffer for a given media type, in seconds. If no type is passed in, then the minimum of video, audio and subtitle buffer length is returned. NaN is returned if an invalid type is requested, the presentation does not contain that type, or if no arguments are passed and the presentation does not include any adaption sets of valid media type. |
| liveLatency | | | | float | none | Current live stream latency in seconds based on the latency measurement. |
| mediaSetting[ ] | | | | MPDAdaptationSet | MediaType  "video", "audio" and "subtitle" | Current media settings for each media type based on the CMAF Header and the MPD information based on the selected Adaptation Set for this media type. |
| mediaTime | | | | float | None | Current media playback time from media playback platform. The media time is in seconds and is relative to the start of the playback and provides the media that is actually rendered. |
| playbackRate | | | | float | None | The current rate of playback. For a video that is playing twice as fast as the default playback, the playbackRate value should be 2.00. |
| availableServiceDescriptions[ ] | | | | Array of service descriptions |  | Provides the list of available selectable service descriptions with an id to select from. Those are either configured ones or the ones in the MPD. |
| availableMediaOptions[ ] | | | | List of Adaptation Set or Preselection ids | MediaType  "video", "audio" "subtitle" "all" | Provides the list of available media options that can be selected by the application based on the capability discovery and the subset information. |
| service‌Operation‌Points | | | | array(Service‌Operation‌Point) |  | The set of Service Operation Points declared in the presentation manifest (e.g. DASH MPD) of the current media presentation. |
| operative‌Service‌Operation‌Point | | | | integer |  | A zero-based index into the service‌Operation‌Points array indicating the Service Operation Point currently operative in the playback session.  Set to -1 if the array is empty. |
| metrics[ ][ ] | | | | Metrics |  | A data blob of metrics for each configured metrics collecting scheme. |
| multipathConnectionStatus | | | | Object |  | Status information of multipath delivery connection |
|  | interfaceStatus | | | array(Object) |  | Status information of interface within the multipath delivery connection |
|  |  | interfaceIdentifier | | Integer |  | Identifier of the interface |
|  |  | numberofPaths | | Integer |  | Number of MPTCP subflows or MPQUIC paths on the interface represented by *interfaceIdentifier* |
|  |  | pathStatus | | array(Object) |  | Status information of all MPTCP subflows or MPQUIC paths over the interface |
|  |  |  | pathIdentifier | Integer |  | Identifier of MPTCP subflow or MPQUIC path |
|  |  |  | status | string |  | Status information of MPTCP subflow or MPQUIC path |

Table 13.2.6-2 provides a list of configured operation point information that can be obtained from the client. Any change to a parameter below shall be announced with a notification OPERATION\_POINT\_CHANGED as specified in table 13.2.5‑1.

Table 13.2.6-2: Media Player Service Operation Point Information

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Type | Definition |
| ServiceOperationPoint | | | Object | The currently configured Service Operation Point parameters according to which the DASH client is operating. |
|  | externalIdentifier | | String | The external identifier uniquely identifying this Service Operation Point in the presentation manifest (e.g. DASH MPD). |
|  | mode | | Enum | The following operation modes are defined:  live: The DASH client operates to maintain configured target latencies using playback rate adjustments and possibly resync.  vod: The DASH client operates without latency requirements and rebuffering may result in additional latencies |
|  | maxBufferTime | | Integer | maximum buffer time in milliseconds for the service. |
|  | switchBufferTime | | Integer | buffer time threshold below which the DASH clients attempt to switch Representations. |
|  | latency | | Object | Defines the latency parameters used by the DASH client when operating in live mode. |
|  |  | target | Integer | The target latency for the service in milliseconds. |
|  |  | max | Integer | The maximum latency for the service in milliseconds. |
|  |  | min | Integer | The maximum latency for the service in milliseconds. |
|  | playbackRate | | MediaType  audio, video, all | Defines the playback rate parameters used by the DASH client for catchup mode and deceleration to avoid buffer underruns and maintaining target latencies. |
|  |  | max | Real | The maximum playback rate for the purposes of automatically adjusting playback latency and buffer occupancy during normal playback, where 1.0 is normal playback speed. |
|  |  | min | Real | The minimum playback rate for the purposes of automatically adjusting playback latency and buffer occupancy during normal playback, where 1.0 is normal playback speed. |
|  | bitRate | |  | Defines the operating bit rate parameters used by the DASH client used for a specific media type or aggregated. The values are on IP level. |
|  |  | target | Integer | The target bit rate for the service in bit/s that the client is configured to consume. |
|  |  | max | Integer | The maximum bit rate for the service in bit/s that the client is configured to consume. |
|  |  | min | Integer | The minimum bit rate for the service in bit/s that the client is configured to consume. |
|  | playerSpecificParameters | |  | Player-specific parameters may be provided, for example about the used algorithm, etc. |

End of changes