**3GPP TSG- Meeting #**

**Berlin, Germany, 22nd–26th May 2023** revision of S4-230979

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  |  |
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| ***Source to WG:*** | , Ericsson |
| ***Source to TSG:*** | S4 |
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| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | Addition of Rel-18 features:1. It was identified that a high-level description of 5G Media Streaming features is lacking.
2. Service Operation Points for Dynamic Policies in both downlink and uplink media streaming, in particular to support low-latency streaming (see WID in SP-220614).
3. Service URL handling.
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| ***Summary of change:*** | 1. High-level description of 5G Media Streaming features in new clause 4.0.
	* Including an explanatory note about the applicability of HLS.
2. Service Operation Points for Dynamic Policies:
	* Definition of additional terms in clause 3.1.
	* Domain model in clause 4.0.
	* Updates to Service Access Information baseline parameters (downlink and uplink).
	* Explanation of Service Operation Point signalling.
	* General downlink and uplink call flows for provisioning, ingest, distribution, presentation and monitoring.
	* Specific call flow for low-latency CMAF downlink streaming using of Service Operation Point Signalling.
3. Service URL handling:
	* Adjustments to architecture, reference points and baseline parameters (downlink and uplink).
	* General description and baseline parameters of 3GPP Service URL.
	* Adjustments to downlink procedures.
	* Baseline call flow for Service URL handling.
	* Additional call flow for launch of eMBMS services via Service URL.
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| ***Consequences if not approved:*** | Work Item objectives not complete.Poor understanding of specification. |
|  |  |
| ***Clauses affected:*** | 3.1, 4.0 (new), 4.1, 4.2.1, 4.2.2, 4.2.3, 4.3.1, 4.3.2, 4.3.3, 4.10, 5.1, 5.3.2, 5.7.6 (new), 5.7.7 (new), 5.10.7 (new), 6.9 (new), 9 (new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | S4aI230090.S4-230770.Merged in CR0065 from S4-230861.Merged in CR0060 from S4-231076. |

**===== CHANGE =====**

## 3.1 Terms

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

**5GMS System:** An assembly of Application Functions, Application Servers and interfaces from the 5G Media Streaming architecture that support either downlink media streaming services or uplink media streaming services, or both.

NOTE 1: The components of a 5GMS System may be provided by an MNO as part of a 5GS and/or by a 5GMS Application Provider.

**5GMS Application Provider:** A party that interacts with functions of the 5GMS System and supplies a 5GMS-Aware Application that interacts with functions of the 5GMS System.

**5GMS-Aware Application:** Application in the UE, provided by the 5GMS Application Provider, that contains the service logic of the 5GMS application service, and interacts with other 5GMS Client and Network functions via the interfaces and APIs defined in the 5GMS architecture.

NOTE 2: Functionality of the 5GMS-Aware Application is outside the scope of this specification.

NOTE 3: A 5GMS-Aware Application associated with the delivery of either a downlink or uplink related 5GMS service is referred to as a 5GMSd-Aware Application or a 5GMSu-Aware Application, respectively.

**5GMS Client:** A UE function that is either a 5GMSd Client or a 5GMSu Client, or both.

**5G Media Streaming Client for downlink (5GMSd Client):** UE function that includes at least a 5G Media Streaming Player and a Media Session Handler for downlink streaming and that may be accessed through well-defined interfaces/APIs.

**5G Media Streaming Client for uplink (5GMSu Client):** Originator of 5GMSu service that includes at least a Media Streamer and a Media Session Handler for uplink streaming and that may be accessed through well-defined interfaces/APIs.

**5GMSu Media Streamer:** UE function that enables uplink delivery of streaming media content to an Application Server function of the 5GMS Application Provider, and which interacts with both the 5GMSu-Aware Application for media capture and subsequent streaming, and the Media Session Handler for media session control.

NOTE 4: The 5GMSu Media Streamer receives a Media Streamer Entry to initiate an uplink streaming session.

NOTE 5: The 5GMSu Media Streamer captures the media on the provided input devices. The 5GMSu Media Streamer exposes some basic controls such as capture, pause, and stop to the 5GMSu-Aware Application.

**Dynamic policy:** A Dynamic PCC Rule (c.f. TS 23.503 [4]) for an uplink or downlink application flow during a media session.

**Egest Session**: An uplink media streaming session from the 5GMSu AS towards the 5GMSu Application Provider.

**Ingest Session:** Asession to upload the media content into a 5GMSd AS.

**Policy Template:** A collection of (semi-static) PCF/NEF API parameters which are specific to the 5GMS Application Provider and also the resulting PCC Rule.

**Policy Template Id**: Identifies the desired policy template, which is used by 5GMSd AF to select the appropriate PCF/NEF API towards the 5G System so that the PCF can compile the desired PCC Rule.

**Media Entry Point:** A Media Player Entry for downlink media streaming or a Media Streamer Entry for uplink media streaming intended to be consumed by a 5GMS Media Stream Handler.

**Media Player Entry:** A document or a pointer to a document that defines a downlink media streaming presentation e.g. MPD for DASH content or URL to a video clip file intended to be consumed by a 5GMSd Media Player.

**Media Session Handler:** UE function that communicates with the 5GMS AF in order to establish and control the delivery of a streaming media session in the downlink or uplink direction, and which also exposes APIs to the 5GMS-Aware Application and to the Media Player (for downlink streaming) or the Media Streamer (for uplink streaming).

**Media Streamer Entry:** A pointer (e.g. in the form of a URL) that defines an entry point of an uplink media streaming session intended to be consumed by a 5GMSu Media Streamer.

**media streaming session:** A session initiated by a 5GMS-Aware Application that involves one or more media streams being delivered between the 5GMS AS and the 5GMS Client via reference point M4.

**presentation entry:** A document or a pointer to a document that defines an application presentation e.g. an HTML5 document as defined in e.g. TS 26.307 [6].

**Provisioning Session:** A data structure supplied at interface M1 by a 5GMS Application Provider that configures the 5GMS features relevant to a set of 5GMS-Aware Applications.

**5GMSd Media Player:** UE function that enables playback and rendering of a media presentation based on a Media Player Entry and exposing some basic controls such as play, pause, seek, stop to the 5GMSd-Aware Application.

NOTE 6: A 5GMSd Media Player is expected to include a Media Access Client, Media Decoders, Media rendering/presentation, and possibly also a DRM Client a Consumption Measurement and Logging Client and a Metrics Measurement and Logging Client. The 5GMSd Media Player's Media Access Client receives a Media Player Entry. The 5GMSd Media Player renders the media on the provided output devices, such as a display in case of video.

NOTE 7: The 5GMSd Media Player is functionally similar to the combination of a TS 26.247 [7] 3GP-DASH client and a TS 26.234 [8] PSS media decoder and renderer.

**Service Access Information**: Set of parameters and addresses that are needed by a 5GMS Client to activate the reception of a downlink media streaming session or the transmission on an uplink media streaming session, perform dynamic policy invocation, consumption reporting and/or metrics reporting, and request AF-based network assistance.

**Service and Content Discovery:** Functionality and procedures provided by a 5GMSd Application Provider to a 5GMS-Aware Application that enables the end user to discover the available streaming service and content offerings and select a specific service or content item for access.

NOTE 8: The Service and Content Discovery functionality and procedures are outside the scope of this specification.

**Service Announcement**: Procedures conducted between the 5GMS-Aware Application and the 5GMS Application Provider such that the 5GMS-Aware Application is able to obtain 5GMS Service Access Information, either directly or in the form of a reference to that information.

**Service Data Flow:** As defined in TS 23.503 [4] ("An aggregate set of packet flows carried through the UPF that matches a service data flow template").

**Service Data Flow Description:** A set of parameters and/or parameter ranges used by the 5GMS AF to create a Service Data Flow Template.

**Service Description**: A set of parameters and/or parameter ranges describing the requirements of the streaming service, used by the Media Stream Handler to follow the service requirements and associated with a Service Operation Point.

**Service Operation Point**: An abstract set of parameters and/or parameter ranges defining service requirements for media streaming that may be supported by a Dynamic Policy in the 5GMS System and described as part of a Service Description or provided as information to the Media Stream Handler.

**third party player:** Part of an application that uses APIs to exercise selected 5GMSd functions to play back media content.

NOTE 9: Such APIs are for example defined in TS 26.307 [6] when using the Media Source Extensions for media playback. This type of player is downloaded by or built into an application, or it is downloaded with the Presentation Entry (e.g. as a JavaScript library).

**third party uplink streamer:** Part of an application that uses APIs to exercise selected 5GMSu functions to capture and stream media content.

NOTE 10: This type of streamer is typically implemented as downloadable software.

**===== CHANGE =====**

# 4 Media Streaming architecture

## 4.0 Media Streaming features

### 4.0.1 Introduction

This clause defines a set of high-level features for supporting enhanced media streaming in the 5G System. The functional architecture of this 5G Media Streaming (5GMS) System is defined in clause 4.1 and is further specialised for downlink media streaming (clause 4.2) and uplink media streaming (clause 4.3). Procedures for downlink media streaming are defined in clause 5 and those for uplink media streaming in clause 6.

In the context of the present document, s

References to Dynamic Adaptive Streaming over HTTP (MPEG‑DASH) [29] in the present document apply equally to HTTP Live Streaming (HLS) [28] except where noted otherwise. The term *Media Entry Point* is used to refer generically to an MPEG-DASH Media Presentation Description (MPD) but may be taken to apply equally to alternative media presentation description formats such as an HLS master playlist, unless noted otherwise.

Table 4.0.1‑1 lists the principal features of the 5GMS architecture along with cross-references to relevant clauses defining its functions and procedures.

Table 4.0.1‑1: 5G Media Streaming feature index

|  |  |  |
| --- | --- | --- |
| Feature | Feature description clause | Procedure definition clause(s) |
| Downlink media streaming | Uplink media streaming |
| Content hosting | 4.0.2 | 5.4 | Not applicable |
| Content publishing | 4.0.3 | Not applicable | 6.2.3 |
| Content preparation | 4.0.4 | Not defined | Not defined |
| Network assistance | 4.0.5 | 5.9 | 6.5, 6.7 |
| Dynamic policies | 4.0.6 | 5.8, 5.7.6 | 6.9 |
| Remote control | 4.0.7 | Not applicable | 6.6 |
| Consumption reporting | 4.0.8 | 5.6 | Not applicable |
| QoE metrics reporting | 4.0.9 | 5.5 | Not applicable |
| Edge processing | 4.0.10 | 8 |
| eMBMS delivery | 4.0.11 | 5.10 | Not applicable |
| Data collection, reporting and exposure | 4.0.12 | 5.11 | 6.8 |
| Service URL handling | 4.0.13 | 9, 5.10.7 | 9 |

The following clauses introduce these features in terms of network-side components ("5GMS network services") and a UE-side client component referred to variously as the *5GMSd Client* (for downlink media streaming), *5GMSu Client* (for uplink media streaming), or simply *5GMS Client* (in the case of features applicable to either downlink media streaming or uplink media streaming).

## 4.0.2 Content hosting

The content hosting feature is applicable to downlink media streaming only. It provides a service equivalent to a Content Delivery Network (CDN) deployed inside or outside the Trusted DN. High-level procedures for this feature are defined in clause 5.4.

 

Figure 4.0.2‑1: High-level arrangement for content hosting feature

When a 5GMSd Application Provider has provisioned the content hosting feature for downlink media streaming:

1. Media content is either retrieved by a network-side component of the 5GMS System from a media origin at the 5GMSd Application Provider (pull-based content ingest) or else it is published to a network-side component of the the 5GMS System by the 5GMSd Application Provider (push-based content ingest).

2. The network-side component of the 5GMS System may cache this content for a configurable period of time.

3. Network-side components of the 5GMS System may manipulate the content according to rules provisioned in Content Preparation Templates (see clause 4.0.4).

4. The 5GMSd Client in the UE subsequently retrieves the (possibly manipulated) media content as part of a downlink media streaming session. The security of the content served to the 5GMSd Client by network-side components of the 5GMS System may be guaranteed by a provisioned Server Certificate.

In addition, the use of content hosting by 5GMSd Clients is logged by the 5GMS System and, if suitably provisioned, is exposed by it to subscribing 5GMSd Application Providers in the form of events. This information is equivalent to that contained in CDN access logs (see also clause 4.0.12).

## 4.0.3 Content publishing

The content publication feature is applicable to uplink media streaming only. High-level procedures for this feature are defined in clause 6.2.3.



Figure 4.0.3‑1: High-level arrangement for content publishing feature

When a 5GMSu Application Provider has provisioned the content publishing feature for uplink media streaming:

1. Media content is published by the 5GMSu Client in the UE to a network-side component of the 5GMS System as part of an uplink media streaming session. The security of the content published to the 5GMS System may be guaranteed by a provisioned Server Certificate.

2. The network-side component of the 5GMS System may cache this content for a configurable period of time.

3. Network-side components of the 5GMS System may manipulate the content according to rules provisioned in Content Preparation Templaes (see clause 4.0.4).

4. A network-side component of the 5GMS System makes the media content available for retrieval by the 5GMSu Application Provider (pull-based content egest) or publishes it directly to the 5GMSu Application Provider (push-based content egest).

## 4.0.4 Content preparation

The content preparation feature is applicable to both downlink media streaming (where is is provisioned as part of the content hosting feature introduced in clause 4.0.2) and uplink media streaming (where is is provisioned as part of the content publishing feature introduced in clause 4.0.3). The content preparation feature enables a 5GMS Application Provider to specify content manipulation by network-side components of the 5GMS System according to provisioned Content Preparation Templates.

When a 5GMSd Application Provider has provisioned the content preparation feature for downlink media streaming:

1. Network-side components of the 5GMS System may manipulate ingested media content and may cache the manipulated content prior to serving it to the 5GMSd Client in the UE.

When a 5GMSu Application Provider has provisioned the content preparation feature for uplink media streaming:

1. Network-side components of the 5GMS System may manipulate the media content ingested from the 5GMSu Client in the UE and may cache the manipulated content prior to egesting it to the 5GMSu Application Provider.

## 4.0.5 Network assistance

The network assistance feature is applicable to both downlink media streaming and uplink media streaming. It enables the 5GMS Client in the UE to interrogate or manipulate the network Quality of Service for an ongoing media streaming session.

High-level procedures for this feature are defined in clause 5.9 (downlink media streaming) and in clauses 6.5 and 6.7 (uplink media streaming). The network assistance feature is not explicitly provisioned by the 5GMS Application Provider. It is either available for a particular media streaming session or not, depending on system pre-configuration and/or policy.

Two mechanisms for obtaining network assistance are defined in the present document: one based on interactions with the PCF via network-based components of the 5GMS System (*AF-based network assistance*), the other based on ANBR signalling interactions between the UE modem and the RAN (*ANBR-based network assistance*).



Figure 4.0.5‑1: High-level arrangement for network assistance feature

The following AF-based network assistance sub-features are defined in this release:

1. *Bit rate estimation.* The 5GMS Client requests an estimate from a network-side component of the 5GMS System of the bit rate that can currently be offered by a media streaming session. The network-side component interrogates the PCF on behalf of the 5GMS Client to obtain this information about the PDU session corresponding to the media streaming session.

 The 5GMS Client uses this information to adjust its own streaming bit rate to fit within the Quality of Service (QoS) envelope that the network is able to offer, for example by switching to a different representation listed in its Media Entry Point, or by adjusting the encoding bit rate for uplink streaming to fits within this bit rate budget. The media streaming Quality of Experience (QoE) is more stable and consistent as a consequence.

2. *Bit rate boost.* The 5GMS Client speculatively requests a temporary boost to the bit rate of a media streaming session from a network-side component of the the 5GMS System. The network-side component requests a modification to the PDU session corresponding to the media streaming session from the PCF on behalf of the 5GMS Client. If there is sufficient spare network capacity to accommodate the requested bit rate, it is granted by the 5GMS System on a temporary basis.

 The 5GMS Client uses this temporary boost to speed up media streaming data transfer, for example to replenish a depleted downlink streaming buffer or to complete a download/upload faster than would otherwise be possible.

ANBR-based bit rate estimation is also defined for downlink media streaming (see clause 5.9.3).

ANBR-based bit rate boost is also defined for uplink media streaming (see clause 6.7).

In addition, the use of network assistance by 5GMS Clients is logged by the 5GMS System and, if suitably provisioned, is exposed by it to subscribing 5GMS Application Providers in the form of events (see also clause 4.0.12).

## 4.0.6 Dynamic policies

The dynamic policies feature is applicable to both downlink media streaming and uplink media streaming. It enables the 5GMS Client in the UE to manipulate the network traffic handling policies for an ongoing media streaming session.



NOTE: The PCF is accessed via the NEF when the 5GMS network services are deployed outside the Trusted DN.

Figure 4.0.6‑1: High-level arrangement for dynamic policies



Figure 4.0.6‑2: Domain model for dynamic policies

With reference to figure 4.0.6‑2, dynamic policies work as follows:

1. A conceptual *Service Operation Point* is an abstract set of requirements that support a media streaming service (e.g., SD, HD, UHD). It is identified by an *External reference* that is used to tag *Policy Template* resources provisioned in the 5GMS System and *Service Descriptions* included in *Media Entry Point* documents.

2. The Service Operation Point is embodied in the 5G System by a *Policy Template* which is provisioned in the 5GMS network services by the 5GMS Application Provider within the scope of an umbrella *Provisioning Session*. A Policy Template may be defined as being applicable to a particular Data Network and/or Network Slice. The Policy Template carries the *External reference* and Network QoS parameters corresponding to a single Service Operation Point. (Any number of Policy Templates provisioned for different Data Networks and/or Network Slices may reference the same Service Operation Point.)

3. The 5GMS Application Provider makes one or more *Media Entry Point* documents (e.g. DASH MPDs) available for use by the 5GMS Client. To take advantage of the dynamic policies feature, a Media Entry Point document includes one or more *Service Descriptions*, each identifying the streaming requirements of a presentation that correspond to a single Service Operation Point (e.g., SD, HD, UHD) and identified by means of an *External reference*. The same Service Description may be included in more than one Media Entry Point document in case a common Service Operation Point is applicable to multiple media presentations.

4. When a Media Entry Point is selected by the 5GMS Client at the start of a media streaming session, the 5GMS Client retrieves Service Access Information from a network-side component of the 5GMS System describing the set of available Policy Templates provisioned in step 2 and exposes this to a controlling application on the UE.

5. At the start of a media streaming session, the controlling application on the UE selects one of the Service Descriptions listed in the Media Entry Point document that realises its preferred Service Operation Point. Either the Media Player (when the Service Descriptions are within the Media Entry Point document) or the controlling application (when the Service Descriptions are not within the Media Entry Point document) informs the 5GMS Client of its choice by passing the corresponding External reference to it.

6. If there is a Policy Template available for the current media streaming session with the indicated External reference, the 5GMS Client instantiates this Policy Template by interacting with a network-side component of the 5GMS System in order to realise the Service Operation Point described by the Policy Template and the Service Description. The effect of this is that the corresponding network Quality of Service is applied to the media streaming session.

In addition, the use of dynamic policies by 5GMS Clients is logged by the 5GMS System and, if suitably provisioned, is exposed by it to subscribing 5GMS Application Providers in the form of events (see also clause 4.0.12).

## 4.0.7 Remote control

The remote control feature is applicable to uplink media streaming only. While high-level procedures for integrating this feature into 5G Media Streaming are specified in clause 6.6 of the present document, it is not further defined in this release.

## 4.0.8 Consumption reporting

The consumption reporting feature is applicable to downlink media streaming only in this release. It allows consumption of downlink media streaming to be logged by the 5GMS System and exposed for analysis.



Figure 4.0.8‑1: High-level arrangement for consumption reporting feature

When a 5GMSd Application Provider has provisioned the consumption reporting feature for downlink media streaming:

1. The 5GMSd Client reports consumption of media that is part of downlink media streaming sessions to a network-side component of the 5GMS System.

In addition, the data contained in consumption reports may be exposed by the 5GMS System in the form of events to subscribing 5GMS Application Providers (see also clause 4.0.12).

## 4.0.9 QoE metrics reporting

The QoE metrics reporting feature is applicable to downlink media streaming only in this release. It allows the Quality of Experience of media streaming sessions to be logged by the 5GMS System and exposed for analysis.

Two mechanisms for reporting downlink QoE metrics are defined in the present document: one that involves reports being sent to the OAM via the RAN (*RAN-based QoE metrics reporting*, see clause 5.5.2), the other involving reports sent to the network-based components of the 5GMS System (*AF-based QoE metrics reporting*, see clause 5.5.3).



Figure 4.0.9‑1: High-level arrangement for QoE metrics reporting feature

When a 5GMS Application Provider has provisioned the QoE metrics reporting feature for media streaming:

1. The 5GMS Client reports QoE metrics that it has collected during media streaming sessions to a network-side component of the 5GMS System.

In addition, the data contained in AF-based QoE metrics reports may be exposed by the 5GMS System to subscribing 5GMS Application Providers in the form of events (see also clause 4.0.12).

### 4.0.10 Edge processing

The edge processing feature is applicable to both downlink media streaming and uplink media streaming. It enables the 5GMS Client in the UE to take advantage of edge computing capabilities in the 5GMS System to support media streaming. This feature is defined in clause 4.5 and high-level procedures are defined in clause 8.

### 4.0.11 eMBMS delivery

The eMBMS delivery feature is applicable to downlink media streaming only. It enables the 5GMS System to provision the delivery of downlink media streaming content via eMBMS User Services sessions. This feature is defined in clause 4.6 and high-level procedures are defined in clause 5.10.

### 4.0.12 Data collection, reporting and exposure

The data collection, reporting and exposure feature is applicable to both downlink media streaming and uplink media streaming. It enables the 5GMS System to log data relating to media streaming sessions and to expose this to subscribers in the form of *Events*. This feature is defined in clause 4.7 and high-level procedures are defined in clause 5.11 (for downlink media streaming) and clause 6.8 (for uplink media streaming).

### 4.0.13 Service URL handling

Service URL handling is applicable to downlink and uplink media streaming. This feature is defined in clause 4.10 and high-level procedures are defined in clause 9.

The intent of 3GPP Service URL handling is to launch UE functions based on the execution of a URL. This enables 5G Media Streaming services to be announced within a third-party application, a general web page, a messaging service or shared via social messages using a 3GPP Service URL for 5GMS. When a service is launched using a 3GPP Service URL for 5GMS, a 5GMS Client function for media session handling is expected to be launched implicitly alongside, for example, a primary media stream handling function.

**===== CHANGE =====**

## 4.1 General service architecture

(No further changes to clause 4.1)

**===== CHANGE =====**

### 4.2.1 Standalone – Non-Roaming

The 5GMSd Application Provider uses 5GMSd functions for downlink streaming services. It provides a 5GMSd-Aware Application on the UE the ability to make use of 5GMSd Client and network functions using 5GMSd interfaces and APIs.

The architecture in Figure 4.2.1-1 below represents the specified 5GMSd functions within the 5G System (5GS) as defined in TS 23.501 [2]. Three main functions are defined:

- **5GMSd AF:** An Application Function similar to that defined in TS 23.501 [2] clause 6.2.10, dedicated to 5G Downlink Media Streaming.

- **5GMSd AS:** An Application Server dedicated to 5G Downlink Media Streaming.

- **5GMSd Client:** A UE internal function dedicated to 5G Downlink Media Streaming. The 5GMSd Client is a logical function and its subfunctions may be distributed within the UE according to implementation choice.

5GMSd AF and 5GMSd AS are Data Network (DN) functions and communicate with the UE via the User Plane Function (UPF) using the N6 reference point as defined in TS 23.501 [2].

Functions in trusted DNs are trusted by the operator's network as illustrated in Figure 4.2.3-5 of TS 23.501 [2]. Therefore, AFs in trusted DNs may directly communicate with relevant 5G Core functions.

Functions in external DNs, i.e. 5GMSd AFs in external DNs, may only communicate with 5G Core functions via the NEF using N33.

NOTE 1: The 5GMS architecture may be applied to an EPS although such an application is not specified in the present document and is left to the discretion of deployments and implementations.



Figure 4.2.1-1: 5G Downlink Media Streaming within 5G System

NOTE 2: The functions indicated by the yellow filled boxes are in scope of stage 3 specifications for 5GMS. The functions indicated by the grey boxes are defined in 5G System specifications. The functions indicated by the blue boxes are neither in scope of 5G Media Streaming nor 5G System specifications.

The architecture in Figure 4.2.1-2 below represents the media architecture connecting UE internal functions and related network functions.



Figure 4.2.1-2: Media Architecture for unicast downlink media streaming

NOTE 3: As described in the NOTE of Figure 4.1-2, the functions indicated by the yellow filled boxes are in scope of stage 3 for 5GMSd. The functions indicated by the grey boxes are defined in 5GS. The interfaces indicated by solid lines are in scope of stage 3 for 5GMSd. The interfaces indicated by dashed lines are defined in 5GS. The interfaces indicated by dotted lines are neither in scope of 5GS nor 5GMSd, but are considered as part of informative call flows.

NOTE 4: Red ovals indicate API provider functions.

NOTE 5: The 5GMSd AF may also interact with the NEF for NEF-enabled API access. However, within Release 16, the NEF is only used by the 5GMSd AF to interact with the Policy and Charging Function (PCF) in 5GMS specifications.

NOTE 6: Some information might also be exchanged between 5GMSd entities and the OAM, although the OAM is not explicitly shown in the architecture.

The following functions are defined:

- 5G Media Streaming Client for downlink (**5GMSd Client**) on the UE: Receiver of 5GMS downlink media streaming service that may be accessed through well-defined interfaces/APIs. Alternatively, the UE may be implemented in a self-contained manner such that interfaces M6d and M7d are not exposed at all.

- The 5GMSd Client contains two subfunctions:

- **Media Session Handler:** A function on the UE that communicates with the 5GMSd AF in order to establish, control and support the delivery of a media session, and may perform additional functions such as consumption and QoE metrics collection and reporting. The Media Session Handler may expose APIs that can be used by the 5GMSd-Aware Application. The Media Session Handler may be launched by a 3GPP-defined Service URL.

- **Media Player:** A function on the UE that communicates with the 5GMSd AS in order to stream the media content and may provide APIs to the 5GMSd-Aware Application for media playback and to the Media Session Handler for media session control.

- **5GMSd-Aware Application:** The 5GMSd Client is typically controlled by an external media application, e.g. an App, which implements external application or content service provider specific logic and enables a media session to be established. The 5GMSd-Aware Application is not defined within the 5G Media Streaming specifications, but the function makes use of 5GMSd Client and network functions using 5GMSd interfaces and APIs.

- **5GMSd AS:** An Application Server which hosts 5G media functions. Note that there may be different realizations of the 5GMSd AS, including the distribution of 5GMSd AS functionality between different physical hosts, for example in a Content Delivery Network (CDN).

 The 5GMSd AS in this release supports the following features:

i. **Content Hosting**, including:

- Ingesting media content from a 5GMSd Application Provider at reference point M2d.

- Caching media content to reduce the need to ingest the same content repeatedly at reference point M2d.

- A generic framework for content preparation.

- Geographic restrictions on content access by the Media Player at reference point M4d ("geofencing").

- Domain Name aliasing at reference point M4d.

- Support for server certificates at reference point M4d.

- URL path rewriting at reference point M4d.

- URL signing at reference point M4d.

NOTE 6a: The features of the 5GMSd AS cater primarily for media streaming content. However, many of these features may also be used to support the delivery of other types of content, for example web content.

- **5GMSd Application Provider:** External application or content-specific media functionality, e.g., media creation, encoding and formatting that uses 5GMSd interfaces to stream media to 5GMSd-Aware Applications.

- **5GMSd AF:** An Application Function that provides various control functions to the Media Session Handler on the UE and/or to the 5GMSd Application Provider. It may relay or initiate a request for different Policy or Charging Function (PCF) treatment or interact with other network functions via the NEF.

NOTE 7: There may be multiple 5GMSd AFs present in a deployment and residing within the Data Network , each exposing one or more APIs.

The following interfaces are defined for 5G Downlink Media Streaming:

- M1d (5GMSd Provisioning API): External API, exposed by the 5GMSd AF which enables the 5GMSd Application Provider to provision the usage of the 5G Media Streaming System for downlink media streaming and to obtain feedback.

- M2d (5GMSd Ingest API): Optional External API exposed by the 5GMSd AS used when the 5GMSd AS in the trusted DN is selected to host content for the streaming service.

- M3d: (Internal and NOT SPECIFIED): Internal API used to exchange information for content hosting on a 5GMSd AS within the trusted DN.

- M4d (Media Streaming APIs): APIs exposed by a 5GMSd AS to the Media Player to stream media content.

- M5d (Media Session Handling API): APIs exposed by a 5GMSd AF to the Media Session Handler for media session handling, control, reporting and assistance that also include appropriate security mechanisms, e.g. authorization and authentication.

- M6d (UE Media Session Handling APIs): APIs exposed by a Media Session Handler to the Media Player for client-internal communication, and exposed to the 5GMSd-Aware Application enabling it to make use of 5GMS functions. This API may be supported by a 3GPP-defined Service URL.

- M7d (UE Media Player APIs): APIs exposed by a Media Player to the 5GMSd-Aware Application and Media Session Handler to make use of the Media Player.

- M8d: (Application API): application interface used for information exchange between the 5GMSd-Aware Application and the 5GMSd Application Provider, for example to provide Service Access Information to the 5GMSd-Aware Application. This API is external to the 5G System and not specified by 5GMS.

NOTE 8: Non-Standalone, Roaming, Non-3GPP Access and EPC-5GC interworking aspects are FFS.

The following subfunctions are identified as a part of a more detailed breakdown of the 5GMSd AS for stage 3 specifications:

- Adaptive Bit Rate (ABR) Encoder, Encryption and Encapsulator.

- Manifest (e.g. MPD) Generator and Segment (e.g. DASH) Packager.

- Origin Server.

- CDN Server (e.g. Edge Servers).

- DRM Server (e.g. DRM License Server).

- Service Directory.

- Content Guide Server.

- Replacement content server (e.g. Ad content server).

- Manifest Proxy, i.e. MPD modification server.

- App Server.

- Session Management Server.

A breakdown of 5GMSd functions in the UE is provided in clause 4.2.2 below.

**===== CHANGE =====**

### 4.2.2 UE 5GMSd functions

The UE may include many detailed subfunctions that can be used individually or controlled individually by the 5GMSd-Aware Application. This clause breaks down several relevant identified subfunctions for which stage 3 specification is available.

NOTE: This UE architecture is logical; the realization of reference points M6 and M7 inside the logical 5GMS Client is subject to implementation choice.

The 5GMSd-Aware Application itself may include many functions that are not provided by the 5GMSd Client or by the 5G UE. Examples include service and content discovery, notifications and social network integration. The 5GMSd-Aware Application may also include functions that are equivalent to ones provided by the 5GMSd Client and may only use a subset of the 5GMSd client functions. The 5GMSd-Aware Application may act based on user input or may for example also receive remote control commands from the 5GMSd Application Provider through M8d.

With respect to Media Player functions, Figure 4.2.2-1 below shows more detailed functional components of a UE for media player functions to access the 5GMSd AS.



Figure 4.2.2-1: UE 5G Downlink Media Streaming Functions (Media Player centric)

The following subfunctions are identified as part of a more detailed breakdown of the Media Player function:

- **Media Access Client:** Accesses media content such as DASH-formatted media segments.

- **Media Decapsulation:** Extracts the elementary media streams for decoding and provides media system related functions such as time synchronization, capability signalling, accessibility signalling, etc.

- **Consumption Measurement and Logging Client:** Performs the measurement and logging of content consumption-related information in accordance with the Consumption Reporting Configuration part of provisioning data, supplied by the 5GMSd Application Provider to the 5GMSd AF, and forwarded by the 5GMSd AF to the Media Player via the Media Session Handler.

- **Metrics Measurement and Logging Client:** Performs the measurement and logging of QoE metrics in accordance with the Metrics Reporting Configuration part of provisioning data, supplied by the 5GMSd Application Provider to the 5GMSd AF, and forwarded by the 5GMSd AF to the Media Player via the Media Session Handler.

- **DRM Client** (optional): When present, the DRM client might or might not be a part of the Media Player. It provides a content protection mechanism with its unique key management and key delivery system, authentication/‌authorization, policy enforcement and entitlement check. The DRM Client is not defined within 5G Media Streaming specifications.

- **Media Decryption** (optional): When present, media decryption is responsible to decrypt the media samples using the keys provided in the DRM license, and further passing to the Media Decoder to enable playback of encrypted media. The media decryption and media decoding could be implemented on a general-purpose processor in software or hardware or, for a more secure and robust architecture, the decryption, decoding and rendering could be implemented on the hardware of secure processors.

- **Media Decoder**: Decodes the media, such as audio or video.

- **Media Presentation and Rendering:** Presents the media using an appropriate output device and enables possible interaction with the media.

With respect to the Media Session Handler, Figure 4.2.2-2 below shows more detailed functional components of a UE to access the 5GMSd AF.



Figure 4.2.2-2: UE 5G Media Streaming Functions (Control-Centric)

NOTE 1: The yellow colour indicates here that the 3GPP has created specifications for the function.

NOTE 2: A UE is a logical device which may correspond to the tethering of multiple physical devices or other types of realizations.

The following subfunctions are identified as part of a more detailed breakdown of Media Session Handler:

- **Core Functions:** Realization of a "session" concept for media communications, optionally spanning multiple stateless sessions. May optionally interact with network-based 5GMSd AFs.

- **Metrics Collection and Reporting:** executes the collection of QoE metrics measurement logs from the Media Player and sending of metrics reports to the 5GMSd AF for the purpose of metrics analysis or to enable potential transport optimizations by the network.

- **Consumption Collection and Reporting:** executes the collection of content consumption measurement logs from the Media Player and sending of consumption reports to a 5GMSd AF about the currently consumed media within the available presentation, about the UE capabilities and about the environment of the media session for potential transport optimizations by the network or consumption report analysis.

- **Network Assistance:** downlink streaming delivery assisting functions provided by the network to the 5GMSd Client and Media Player in the form of bit rate recommendation (or throughput estimation) and/or delivery boost. Network Assistance functionality may be supported by 5GMSd AF or ANBR-based RAN signalling mechanisms.

- **Service URL Handling:** a UE function that handles 3GPP Service URLs to support the launch of 5GMSd services and associated functions in the UE and in the network.

NOTE 2a: While this function may not be exclusive to 5GMS, this specification only defines Service URL handling for 5GMS.

NOTE 3: Based on such a decomposition, additional interfaces and APIs may exist in inside the UE:

- Media control interface(s) to configure and interact with the different UE media functions.

- Media control interface for media session management.

- Control interface for collection of logged QoE metrics measurements.

- Control interface for collection of logged content consumption measurements.

- Decoded media samples are handed over to the media renderer.

- Decrypted, compressed media samples are handed over to a trusted media decoder.

- In the case of encryption, the encrypted, compressed media samples are handed over to the DRM Client.

NOTE 4: Non-Standalone, Roaming, Non-3GPP Access and EPC-5GC interworking aspects are FFS.

**===== CHANGE =====**

### 4.2.3 Service Access Information for downlink media streaming

The Service Access Information is the set of parameters and addresses which are needed by the 5GMSd Client to activate and control the reception of a downlink streaming session, and to report service/content consumption and/or QoE metrics.

The Service Access Information may be provided together with other service announcement information using M8d. Alternatively, the 5GMSd Client fetches the Service Access Information from the 5GMSd AF. The Service Access Information may be provided as, or may be accessed via, a 3GPP-defined Service URL that provides a unique resolvable identifier to the 5GMSd Provisioning Session and that may also include a reference to the Media Player Entry. Regardless of how it is provided, the Service Access Information contains different information, depending on the collaboration model between the 5GMS System and the 5GMSd Application Provider, and also depending on offered features. Baseline parameters are listed in Table 4.2.3‑1 below:

Table 4.2.3-1: Parameters of baseline Service Access Information

|  |  |
| --- | --- |
| Parameters | Description |
| Provisioning Session identifier | Unique identification of the M1d Provisioning Session. |

When the content hosting feature is activated for a downlink streaming session, the parameters from Table 4.2.3-1a below can additionally be present.

Table 4.2.3-1a: Streaming Access parameters

|  |  |
| --- | --- |
| Parameters | Description |
| Media Player Entries | A set of pointers to documents that each define an equivalent media presentation (see NOTE), e.g. MPD for DASH content or URL to a video clip file.Each member of the set may specify additional details to aid selection by the MBMS Client, including content type, profile indicators and precedence.A Media Player Entry document may additionally include Service Descriptions, each one identified by an *External reference* that enables it to be matched with a Policy Template, and each describing the set of media streaming parameters (e.g., bit rate, target latency) that realise a Service Operation Point.A Media Player Entry URL may be embedded in a 3GPP Service URL. |
| NOTE: An equivalent media presentation is one which has the same content but may result in a different Quality of Experience. |

When the consumption reporting feature is activated for a downlink streaming session, the parameters from Table 4.2.3‑2 below are additionally present.

Table 4.2.3-2: Parameters for consumption reporting configuration

|  |  |
| --- | --- |
| Parameters | Description |
| Reporting interval | Identifies the interval between consumption reports being sent by the Media Session Handler. |
| Server address | A list of 5GMSd AF addresses where the consumption reports are sent by the Media Session Handler. |
| Sample percentage | The proportion of clients that shall report media consumption.If not specified, all clients shall send reports. |
| Location reporting | Identify whether the Media Session Handler provides location data to the 5GMSd AF (in case of MNO or trusted third parties) |

When the dynamic policy invocation feature is activated for a downlink streaming session the parameters from Table 4.2.3‑3 below are additionally present.

Table 4.2.3-3: Parameters for dynamic policy invocation configuration

|  |  |
| --- | --- |
| Parameters | Description |
| Server address | A list of 5GMSd AF addresses (in the form of opaque URLs) which offer the APIs for dynamic policy invocation sent by the 5GMS Media Session Handler. |
| Valid Policy Template Ids | A list of Policy Template identifiers which the 5GMSd Client is authorized to use. |
| Service Data Flow Methods | A list of recommended Service Data Flow description methods (descriptors), e.g. 5-Tuple, ToS, 2-Tuple, etc, which should be used by the Media Session Handler to describe the Service Data Flows for the traffic to be policed. |
| External reference | Additional identifier for this Policy Template, unique within the scope of its Provisioning Session, that can be cross-referenced with external metadata about the streaming session. |

When the metrics collection and reporting feature is activated for a downlink streaming session, one or more parameter sets for metrics configuration, according to Table 4.2.3‑4, are additionally present. Each metrics configuration set contains specific settings valid for that configuration, which is typically metric scheme dependent, and collection and reporting shall be done separately for each set.

Table 4.2.3-4: Parameters for each metrics configuration set

|  |  |
| --- | --- |
| Parameters | Description |
| Scheme | The scheme associated with this metrics configuration set. A scheme may be associated with 3GPP or with a non-3GPP entity. If not specified, a default 3GPP metrics scheme shall apply.Metrics schemes shall be uniquely identified by URIs. |
| Server address | A list of 5GMSd AF addresses to which metric reports shall be sent for this metrics configuration set. |
| DNN | The Data Network Name (DNN) which shall be used when sending metrics report for this metrics configuration set.If not specified, the default DNN shall be used. |
| Slice scope | A list of network slice(s) for which metrics collection and reporting shall be executed for this metrics configuration set.If not specified, the metrics collection and reporting shall be done for all network slices. |
| Reporting interval | The sending interval between metrics reports for this metrics configuration set.If not specified, a single final report shall be sent after the streaming session has ended. |
| Sample percentage | The proportion of streaming sessions that shall report metrics for this metrics configuration set.If not specified, reports shall be sent for all sessions. |
| Streaming source filter | A list of content URL patterns for which metrics reporting shall be done for this metrics configuration set.If not specified, reporting shall be done for all URLs. |
| Metrics | A list of metrics which shall be collected and reported for this metrics configuration set.For progressive download and DASH streaming services, the listed metrics 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 [7].In addition, for the 3GPP metrics scheme as applied to DASH streaming, the quality reporting scheme and quality reporting protocol as defined in clauses 10.5 and 10.6, respectively, of [7] shall be used.If not specified, a complete (or default if applicable) set of metrics will be collected and reported. |

When 5GMSd AF-based Network Assistance is activated for a downlink streaming session the parameters from Table 4.2.3‑5 below shall be additionally present.

Table 4.2.3-5: Parameters for 5GMSd AF-based Network Assistance configuration

|  |  |
| --- | --- |
| Parameters | Description |
| Server address | 5GMSd AF address that offers the APIs for 5GMSd AF-based Network Assistance, accessed by the 5GMSd Media Session Handler. The server address shall be an opaque URL, following the 5GMS URL format. |

**===== CHANGE =====**

### 4.3.1 Media architecture

The 5GMSu Application Provider uses 5GMSu functions for uplink streaming services. It provides a 5GMSu-Aware Application on the UE the ability to make use of 5GMSu Client and network functions using 5GMSu interfaces and APIs.



Figure 4.3.1-1: Media Architecture for unicast uplink media streaming

NOTE 1: The functions indicated by the yellow filled boxes are in scope of stage 3 specifications for 5GMS. The functions indicated by the grey boxes are defined in 5G System specifications. The functions indicated by the blue boxes are neither in scope of 5G Media Streaming nor 5G System specifications.

The architecture in Figure 4.3.1-1 above represents the specified 5GMSu functions within the 5G System (5GS) as defined in TS 23.501 [2]. Three main functions are defined:

- **5GMSu AF:** An Application Function similar to that defined in TS 23.501 [2] clause 6.2.10, dedicated to 5G Uplink Media Streaming.

- **5GMSu AS:** An Application Server dedicated to 5G Uplink Media Streaming.

- **5GMSu Client:** A UE-internal function dedicated to 5G Uplink Media Streaming.

5GMSu AF and 5GMSu AS are Data Network (DN) functions and communicate with the UE via N6 as defined in TS 23.501 [2].

Functions in trusted DNs, e.g., a 5GMSu AF in the Trusted DN, are trusted by the operator's network as illustrated in Figure 4.2.3-5 of TS 23.501 [2]. Therefore, such AFs may directly communicate with relevant 5G Core functions.

Functions in external DNs, e.g., a 5GMSu AF in the External DN, may only communicate with 5G Core functions via the NEF using N33.

The architecture in Figure 4.3.1-2 below represents the media architecture connecting UE internal functions and related network functions for 5G Uplink Media Streaming.



Figure 4.3.1-2: Media Architecture for unicast uplink media streaming

NOTE 2: The functions indicated by the yellow filled boxes are in scope of stage 3 for 5GMSu. The functions indicated by the grey boxes are defined in 5GS. The interfaces indicated by solid lines are in scope of stage 3 for 5GMSu. The interfaces indicated by dashed lines are defined in 5GS. The interfaces indicated by dotted lines are neither in scope of 5GS nor 5GMSu, but are considered as part of informative call flows.

NOTE 3: Red ovals indicate API provider functions.

NOTE 4: The 5GMSu AF may also interact with the NEF for NEF-enabled API access. However, within Release 16, the NEF is only used by the 5GMSu AF to interact with the Policy and Charging Function (PCF) in 5GMS specifications.

NOTE 5: Some information might also be exchanged between 5GMSu entities and the OAM, although the OAM is not explicitly shown in the architecture.

The following functions are defined:

- 5G Media Streaming Client for uplink (**5GMSu Client**) on UE: Originator of 5GMSu service that may be accessed through well-defined interfaces/APIs. The UE may also be implemented in a self-contained manner such that interfaces M6u and M7u are not exposed at all.

- The 5GMSu Client contains two subfunctions:

- **Media Session Handler:** A function on the UE that communicates with the 5GMSu AF in order to establish, control and support the delivery of a media session, and that may perform QoE metrics reporting. The Media Session Handler exposes APIs that can be used by the 5GMSu-Aware Application. The Media Session Handler may be launched by a 3GPP-defined Service URL.

- **Media Streamer:** A function on the UE that communicates with the 5GMSu AS in order to perform uplink streaming of media content and provides a service to both the 5GMSu-Aware Application for media capturing and uplink streaming and the Media Session Handler for media session control.

- **5GMSu-Aware Application:** The 5GMSu Client is typically controlled by an external media application, e.g. an App, which implements external application or content service provider specific logic and enables a media session to be established. The 5GMSu-Aware Application is not defined within the 5G Media Streaming specifications, but the function makes use of 5GMSu Client and network functions using 5GMSu interfaces and APIs.

- **5GMSu AS:** An Application Server which hosts 5G media functions. Note that there may be different realizations of a 5GMSu AS, for example a Content Delivery Network (CDN) server.

- **5GMSu Application Provider:** External application or content-specific media functionality, e.g., media storage, consumption, transcoding and redistribution that uses 5GMSu interfaces to receive streaming media from 5GMSu Aware Applications.

- **5GMSu AF:** An Application Function that provides various control functions to the Media Session Handler on the UE and/or to the 5GMSu Application Provider. It may relay or initiate a request for different Policy or Charging Function (PCF) treatment or interact with other network functions via the NEF.

NOTE 6: There may be multiple 5GMSu AFs present in a deployment and residing within the Data, each exposing one or more APIs.

The following interfaces are defined for 5G Uplink Media Streaming:

- M1u (5GMSu Provisioning API): External API, exposed by the 5GMSu AF and which enables the 5GMSu Application Provider to provision the usage of the 5G Media Streaming system for uplink media streaming and to obtain feedback.

- M2u (5GMSu Publish API): Optional External API exposed by the 5GMSu AS used when the 5GMSu AS in the trusted DN is selected to receive the content for the streaming service.

- M3u: (Internal and NOT SPECIFIED): Internal API used to exchange information for content hosting on a 5GMSu AS within the trusted DN.

- M4u (Uplink Media Streaming APIs): APIs exposed by a 5GMSu AS to the Media Streamer to stream media content.

- M5u (Media Session Handling API): APIs exposed by a 5GMSu AF to the Media Session Handler for media session handling, control and assistance that also include appropriate security mechanisms e.g. authorization and authentication, and QoE metrics reporting.

- M6u (UE Media Session Handling APIs): APIs that may be exposed by a Media Session Handler to the Media Streamer for client-internal communication, and to the 5GMSu-Aware Application to make use of 5GMSu functions. This API may be supported by a 3GPP-defined Service URL.

- M7u (UE Media Streamer APIs): APIs that may be exposed by a Media Streamer to the 5GMSu-Aware Application and Media Session Handler to make use of the Media Streamer, including configuration of QoE metrics to be measured and logged, and the collection of metrics measurement logs.

- M8u: (Application API): application interface used for information exchange between the 5GMSu-Aware Application and the 5GMSu Application Provider, for example to provide Service Access Information to the 5GMSu-Aware Application. This API is external and not specified in the 5GMS architecture.

NOTE 7: Non-Standalone, Roaming, Non-3GPP Access and EPC-5GC interworking aspects are FFS.

**===== CHANGE =====**

### 4.3.2 UE 5GMSu functions

The UE may include many detailed subfunctions that can be used individually or controlled individually by the 5GMSu-Aware Application. This clause breaks down several relevant identified subfunctions for which stage 3 specification is available.

The 5GMSu-Aware Application itself may include many functions that are not provided by the 5GMSu Client or to the 5G UE. Examples include peripheral discovery, notifications and social network integration. The 5GMSu-Aware Application may also include functions that are equivalent to ones provided by the 5GMSu Client and may only use a subset of the 5GMSu Client functions.

With respect to the Media Streamer and Media Handler functions, Figure 4.3.2-1 shows more detailed functional components of a 5GMSu Client.



Figure 4.3.2-1: UE 5G Uplink Media Streaming Functions

NOTE 1: A UE is a logical device which may correspond to the tethering of multiple physical devices or other types of realizations.

The following subfunctions are identified as part of a more detailed breakdown of the UE 5G Uplink Media Streaming functions:

- **5GMSu-Aware Application:** application which is out of scope of the present specification and which uses the UE 5G Uplink Media Streaming functions and APIs.

- **Media Capturing:** Devices such as video cameras or microphones that transform an analogue media signal into digital media data.

- **Media Encoder(s):** Compresses the media data.

- **Media Upstream Client:** encapsulates encoded media data and pushes it upstream.

- **Network Assistance:** uplink streaming delivery assisting functions provided by the network to the 5GMSu Client and Media Streamer in the form of bit rate recommendation (or throughput estimation) and/or delivery boost. Network Assistance functionality may be supported by 5GMSu AF or ANBR-based RAN signalling mechanisms.

- **Core Functions:** configures the 5GMSu AS for uplink streaming reception.

**- Service URL Handling:** a UE function that handles 3GPP Service URLs to support the launch of 5GMSu services and associated functions in the UE and in the network.

NOTE 2: While this function may not be exclusive to 5GMS, the present document only defines Service URL handling for 5GMS.

Here are the roles of the different APIs of the UE 5G Uplink Media Streaming functions:

- M6u: API used to control the Core Functions and the Media Remote Control function.

- M7u: API used to configure, activate and stop the Media Capturing, Media Encoding(s) and Media Upstream Client functions, and also to support metrics configuration and collection functionality.

**==== CHANGE =====**

### 4.3.3 Service Access Information for uplink media streaming

The Service Access Information is the set of parameters and addresses which are needed by the 5GMSu Client to activate and control the uplink streaming session.

The Service Access Information may be provided by the 5GMSu Application Provider to the 5GMSu-Aware Application together with other service announcement information using M8u. Alternatively, the 5GMSu Client fetches the Service Access Information from the 5GMSu AF at reference point M5u. Regardless of how it is provided, the Service Access Information contains different information, depending on the collaboration model between the 5GMS System and the 5GMSu Application Provider (which are assumed to be independent entities), and also depending on offered features. The Service Access Information may be provided as, or may be accessed via, a 3GPP-defined Service URL that provides a unique resolvable identifier to the 5GMSu media session and that may also include a reference to the Media Entry Point.

Baseline parameters are listed in table 4.3.3‑1 below:

Table 4.3.3-1: Parameters of baseline Service Access Information

|  |  |
| --- | --- |
| Parameters | Description |
| Provisioning Session identifier | Unique identification of the M1u Provisioning Session. |

The parameters from table 4.3.3-2 below shall also be present.

Table 4.3.3-2: Streaming Access parameters

|  |  |
| --- | --- |
| Parameters | Description |
| Media Streamer Entries | A set of entry points. Each entry point consists of one of the following:a. A URL endpoint on the 5GMSu AS to which media can be streamed directly at M4u and its associated data, orb. The URL of a document that can be downloaded from the 5GMSu AS which contains the parameters for uplink media streaming at M4u.A Media Streamer Entry document may additionally include Service Descriptions, each one identified by an *External reference* that enables it to be matched with a Policy Template, and each describing the set of media streaming parameters (e.g., bit rate, target latency) that realise a Service Operation Point.A Media Streamer Entry URL may be embedded in a 3GPP Service URL. |

Each entry point is defined by its parameters and identifiers. The set shall have at least one member.

When the dynamic policy invocation feature is activated for an uplink streaming session the parameters from table 4.3.3‑3 below are additionally present.

Table 4.3.3-3: Parameters for dynamic policy invocation configuration

|  |  |
| --- | --- |
| Parameters | Description |
| Server address | A list of 5GMSu AF addresses (in the form of opaque URLs) which offer the APIs for dynamic policy invocation sent by the 5GMS Media Session Handler. |
| Valid Policy Template Ids | A list of Policy Template identifiers which the 5GMSu Client is authorized to use. |
| Service Data Flow Methods | A list of recommended Service Data Flow description methods (descriptors), e.g. 5-Tuple, ToS, 2-Tuple, etc, which should be used by the Media Session Handler to describe the Service Data Flows for the traffic to be policed. |
| External reference | Additional identifier for this Policy Template, unique within the scope of its Provisioning Session, that can be cross-referenced with external metadata about the streaming session. |

When 5GMSu AF-based Network Assistance is activated for an uplink streaming session the parameters from table 4.3.3‑4 below shall be additionally present.

Table 4.3.3-4: Parameters for 5GMSu AF-based Network Assistance configuration

|  |  |
| --- | --- |
| Parameters | Description |
| Server address | 5GMSu AF address that offers the APIs for 5GMSu AF-based Network Assistance, accessed by the 5GMSu Media Session Handler. The server address shall be an opaque URL, following the 5GMS URL format. |

**===== CHANGE =====**

## 4.10 3GPP Service URL handling

### 4.10.1 General

Where there is a facility for an application or service to launch a UE function on the same UE via a URL request, it is convenient to use such a mechanism to launch media session handling for a 5G Media Streaming session. In this case, the Media Session Handler can be launched implicitly as a result of a request for a URL with a prefix that matches a value previously registered with the UE Operating System by the Media Session Handler. Media streaming may also be launched as a by-product of the URL request by embedding a Media Entry Point in the URL. This enables 5G Media Streaming sessions to be launched by any UE application (not just a 5GMS-Aware Application), or from a link in a web page.

If the Media Session Handler is not available on the UE, or if the Media Session Handler is not able to resolve the service, then the 3GPP Service URL shall resolve to an endpoint on the 5GMS AF which may respond to the URL request, for example by redirecting the application to a Media Entry Point.

This clause defines the baseline requirements for a 3GPP Service URL that can be used to activate a 5G Media Streaming session in line with step 5 of clause 5.1 (for downlink Media Streaming), and steps 4 and 6 of clause 6.1 (for uplink Media Streaming). The detailed baseline procedure for handling these 3GPP Service URLs is defined in clause 9.

### 4.10.2 Baseline parameters of 3GPP Service URL for 5G Media Streaming

The parameters in table 4.10.2-1 may be included explicitly or implicitly in the 3GPP Service URL when it is used to launch a 5G Media Streaming session:

Table 4.10.2-1: Baseline parameters of 3GPP Service URL for 5G Media Streaming

|  |  |  |
| --- | --- | --- |
| Parameter | Use | Description |
| Service type | M | Uniquely indicating either downlink 5G Media Streaming or uplink 5G Media Streaming. |
| External service identiifer | M | A globally unique service identifier nominated by the 5GMS Application Provider that resolves to a Provisioning Session in the 5GMS System. |
| Media Entry Point URLs | 0..N | URLs of Media Entry Points on a 5GMS AS to be launched by the Media Session Handler after successful initiation of media session handling and establishment of communication with the Media Stream Handler (Media Player or Media Streamer). |
| Acceptable media types | C | Indicating a set of media types acceptable to the 5GMS-Aware Application for a 5G Media Streaming session.Present if no Media Entry Point is provided. This value is used by the Media Session Handler to select the appropriate Media Entry Point provided by the 5GMS AF. |
| Acceptable media profiles | C | Indicating a set of acceptable conformance profiles for a 5G Media Streaming session.Present if no Media Entry Point is provided. This value is used by the Media Session Handler to select the appropriate Media Entry Point provided by the 5GMS AF. |

The 3GPP Service URL for 5G Media Streaming may also include information to support handling of eMBMS or MBS delivery.

**===== CHANGE =====**

## 5.1 General

The downlink streaming procedures follow the general high-level workflow depicted in Figure 5.1‑1 below, starting from provisioningandingestsession preparation to the actual content streaming sessions. The **Ingest Session** refers to the time interval during which media content is uploaded to the 5GMSd AS. The **Provisioning Session** refers to the time interval during which the 5GMSd Client can access the media content and the 5GMSd Application Provider can control and monitor the media content and its delivery. Interactions between the 5GMSd AF and the 5GMSd Application Provider may occur at any time while the Provisioning Session is active.



Figure 5.1-1: High Level Procedure for downlink streaming

The 5GMSd provisioning API at M1d allows selection of media session handling (M5d) and media streaming (M4d) options, including whether the media content is hosted on trusted 5GMSd AS instances. of provisioned 5GMSd features is captured in a Provisioning Session (see clause 5.3) that is uniquely identified in the 5GMS System by a Provisioning Session identifier. The Provisioning Session information may include Content Hosting Configurations, Content Preparation Templates, Server Certificates, Policy Templates, a Consumption Reporting Configuration, Metrics Reporting Configurations, Edge Resources Configurations and Event Data Processing Configurations.

The Consumption Reporting and/or Metrics Reporting Configuration information provisioned over M1d and passed to the 5GMSd Client by the 5GMSd AF over M5d determines the UE data to be collected by the 5GMSd Client and subsequently reported to the 5GMSd AF. The 5GMSd Application Provider is additionally able to provision Event Data Processing Configurations that specify data processing instructions for subsequent manipulation by the 5GMSd AF of UE data, whether reported by the 5GMSd Client or otherwise obtained, and rules for restricting the subsequent exposure by the 5GMSd AF of UE data to event consumers including the NWDAF defined in TS 23.288 [23] and/or the 5GMSd Application Provider.

The 5GMSd AF selects the M5d interface features according to the provisioning option. The Media Session Handling interface exposed by the 5GMSd AF can be used for core session handling; configuring content consumption measurement, logging, collection and reporting; configuring QoE metrics measurement, logging collection and reporting; requesting different policy and charging treatments; or 5GMSd AF-based Network Assistance.

When the media content is hosted by trusted 5GMSd AS instances, then the 5GMSd AF selects and configures the 5GMSd AS. Interactions between a 5GMSd AF and a 5GMSd AS (M3d interactions) take place for content hosting configuration, including 5GMS Ingest (M2d) and Media Streaming (M4d) resource reservations. The 5GMSd AS allocates M2d and M4d resources and communicates resource identifiers back to the 5GMSd AF. The 5GMSd AF provides information about the provisioned resources (in form of resource identifiers) for Media Session Handling (M5d), the 5GMSd Ingest (M2d) and the Media Streaming (M4d), to the 5GMSd Application Provider. The resource identifiers for Media Session Handling and Media Streaming are needed by the 5GMSd Client to access the 5GMSd functions.

When Content Hosting is provided by a 5GMSd AS in the external DN, then the M3d interface is not used and the 5GMSd AF does not provide 5GMS Ingest (M2d) and Media Streaming (M4d) resource reservations. M3d procedures are not standardized.

5GMSd Clients can (in principle) start streaming media as soon as the corresponding content is ingested by activating a unicast downlink streaming session. However, it may take some time until the media content is available for Media Streaming (via the Media Streaming API) or the distribution availability might be based on a provisioned schedule. The unicast downlink streaming session for a given UE (or "for each UE") is active from the time at which the 5GMSd-Aware Application activates the reception of a streaming service until its termination.

The 5GMSd-Aware Application receives application data from the 5GMSd Application Provider before receiving the downlink streaming media. The application data contains Service Access Information, which acts as an entry point for the 5GMSd Client to start the downlink streaming session. The 5GMSd Client may either receive a reference to that Service Access Information or the full Service Access Information from the 5GMSd Application Provider.

Steps:

1. The 5GMSd Application Provider creates a Provisioning Session with the 5GMSd AF and starts provisioning the usage of the 5G Media Streaming System. During the establishment phase, the used features are negotiated and detailed configurations are exchanged. The 5GMSd AF receives Service Access Information for M5d (Media Session Handling) and, where media content hosting is negotiated, Service Access Information for M2d (Ingestion) and M4d (Media Streaming) as well. This information is needed by the 5GMSd Client to access the service. Depending on the provisioning, only a reference to the Service Access Information might be supplied.

2. When Content Hosting is offered and selected there may be interactions between the 5GMSd AF and the 5GMSd AS, e.g. to allocate 5GMSd content ingest and distribution resources. The 5GMSd AS provides resource identifiers for the allocated resources to the 5GMSd AF, which then provides the information to the 5GMSd Application Provider. The M3d procedures between 5GMSd AF and 5GMSd AS are not specified.

3. The 5GMSd Application Provider starts the Ingest Session by ingesting content. In case of live services, the content is continuously ingested. In case of on-demand streaming services, the content may be uploaded once and then updated later on.

NOTE 1: A 5GMSd AS in the external Data Network may provide the Content Hosting.

4. The 5GMSd Application Provider provides the Service Announcement Information to the 5GMSd-Aware Application. The service announcement includes either the whole Service Access Information (i.e. details for Media Session Handling (M5d) and for Media Streaming access (M4d)) or a reference to the Service Access Information or pre-configured information. When only a reference is included, the 5GMSd Client fetches (in step 6) the Services Access Information when needed. In a specific case, the 5GMSd service may be announced using a 3GPP Service URL that will launch the service as defined in clause 9.

5. When the 5GMSd-Aware Application decides to begin streaming, the Service Access Information (all or a reference) is provided to the 5GMSd Client. The 5GMSd Client activates the unicast downlink streaming session.

6. (Optional) In case the 5GMSd Client received only a reference to the Service Access Information, then it acquires the Service Access Information from the 5GMSd AF.

NOTE 2: Pre-caching of Service Access Information may also be supported by the 5GMS Client to speed up the activation of the service.

7. The 5GMSd Client uses the Media Session Handling API exposed by the 5GMSd AF at M5d. The Media Session Handling API is used for configuring content consumption measurement, logging, collection and reporting; configuring QoE metrics measurement, logging, collection and reporting; requesting different policy and charging treatments; or 5GMSd AF-based Network Assistance. The actual time of API usage depends on the feature and interactions that may be used during the media content reception.

8. The 5GMSd Client activates reception of the media content.

**===== CHANGE =====**

### 5.3.2 Baseline provisioning procedure

The present clause describes the baseline procedure to provision the features using the 5GMS System.

NOTE 1: SLA negotiations between the 5GMSd Application Provider and the 5GMS System provider are outside the scope of the present specification and are included in the figure below for illustrative purposes only.



Figure 5.3.2-1: High Level Procedure for provisioning the 5GMS System for downlink streaming sessions

Steps:

1. The 5GMSd Application Provider discovers the address (URL) of the 5GMSd AF (M1d) for Session Provisioning.

2. The 5GMSd Application Provider authenticates itself with the system. This procedure reuses existing authentication/authorization procedures, e.g. as defined for CAPIF [13].

3. The 5GMSd Application Provider creates a Provisioning Session, providing its 5GMSd Application Provider identifier as input. 5GMSd Application Provider queries the capabilities and authorized features.

4. The 5GMSd Application Provider specifies one or more 5GMSd features in the Provisioning Session. A set of authorized features is activated, such as content consumption measurement, logging, collection and reporting; QoE metrics measurement, logging, collection and reporting; dynamic policy; network assistance; and content hosting (including ingest).

 One or more *External service identifiers* are supplied by the 5GMSd Application Provider to support the later retrieval of Service Access Information from the 5GMSd AF by the Media Session Handler.

 When the content hosting feature is offered and selected, the 5GMS Application Provider configures the content hosting behaviour of the 5GMSd AS. This Content Hosting Configuration is specified in clause 5.4 and includes selecting the ingest protocol and format, caching and proxying of media objects, content preparation, access protection (e.g. URL signing) and indicating a target distribution area (e.g. through geofencing).

 When the dynamic policy feature is offered and selected, the 5GMSd Application Provider specifies a set of policies which can be invoked for the unicast downlink streaming session. The UE becomes aware of the selected policies in the form of a list of valid Policy Template Ids.

 When the content consumption measurement, logging, collection and reporting feature is offered and selected, the 5GMSd Application Provider indicates the desired reporting interval. When the 5GMSd Application Provider has delegated Service Access Information handling to the 5GMS System, then location reporting is also selected or de-selected.

 When the QoE metrics measurement, logging, collection and reporting feature is offered and selected, the 5GMSd Application Provider provides configuration input on the QoE post processing. When the 5GMSd Application Provider has delegated Service Access Information handling to the 5GMS System, then more detailed metrics reporting is configured.

 When the edge computing feature is offered and selected, the 5GMSd Application Provider provides one or more Edge Resources Configurations that can be used to support either client-driven management or Application Provider-driven management of edge resources associated with the Provisioning Session.

 When the event data processing feature is offered and selected, the 5GMSd Application Provider provides one or more Event Data Processing Configurations that determine how, in the scope of the Provisioning Session, content consumption and QoE metrics collected from the UE and application logs collected from the 5GMSd AS are processed into events and exposed to subscribers.

5. When content hosting is desired, the 5GMSd AF interacts with the 5GMSd AS to allocate M2d resources and configure the ingest format. Then the 5GMSd AS responds with the M2d address. The 5GMSd AF selects the desired ingest format.

6. The 5GMSd AF compiles the Service Access Information. The Service Access Information contains access details and options such as the Provisioning Session identifier, M5d (Media Session Handling) addresses for content consumption reporting, QoE metrics reporting, dynamic policy, network assistance, etc. When content hosting is offered and has been selected in step 4, then also M4d (Media Streaming) information such as the DASH MPD is included.

7. The 5GMSd AF provides the results to the 5GMSd Application Provider.

a. When the 5GMSd Application Provider has selected full Service Access Information, then the results are provided in the form of addresses and configurations for M2d (Ingest), M5d (Media Session Handling) and M4d (Media Streaming).

b. When the 5GMSd Application Provider delegated the service access information handling to the 5GMS System, then a reference to the Service Access Information (e.g. an URL) is provided. The Media Session Handler fetches the full Service Access Information later from the 5GMSd AF.

8. When content hosting is offered and has been selected in step 4, the 5GMSd Application Provider can start supplying content at the M2d ingest interface. In the case of progressive download or on-demand DASH sessions, the 5GMSd Application Provider makes the content assets available. In the case of Live DASH streaming sessions, the 5GMSd Application Provider starts supplying the live content.

9. The 5GMSd Application Provider executes Service Announcement and updates the UEs (during the lifetime of the Provisioning Session).

Optional:

10. The 5GMSd Application Provider may update the Provisioning Session.

Depending on the parameters of the Provisioning Session:

11. The 5GMSd AF may send event-related or periodic notifications to the 5GMSd Application Provider.

According to schedule, or upon request:

12. The 5GMSd Application Provider may manually terminate the Provisioning Session (at any time). All associated resources are released. Content may be removed from the 5GMSd AS. The 5GMSd Application Provider may configure a schedule for Provisioning Session termination.

13. The 5GMSd AF sends a notification upon Provisioning Session termination.

The 5GMSd AF may request the creation or reuse of one or more network slices for distributing the content of the provisioned session. If more than one network slice is provisioned for the distribution of the content of a session, the list of allowed S‑NSSAIs shall be conveyed to the target UEs (e.g. through URSP or through M5d or M8d).

NOTE 2: The 5GMSd AS(s) serving the content are only accessible through the DNN(s) used by the network slice(s) provisioned for the distribution of that content.

**==== CHANGE =====**

### 5.7.6 Dynamic Policy selection for downlink media streaming based on Service Operation Point signalling

This clause provides an extension to the general call flow in clause 5.2.3 in order to address the usage of Service Descriptions to select a Dynamic Policy in downlink 5G Media Streaming services that supports the requirements of an abstract Service Operation Point. Details are shown in figure 5.7.6‑1.



Figure 5.7.6-1: High-level procedure for DASH content streaming
with Service Operation Point handling

Prerequisites:

- The 5GMSd Application Provider has provisioned the content hosting feature in the 5G Media Streaming System.

- The 5GMSd-Aware Application has received the Service Announcement from the 5GMSd Application Provider.

Extended Steps:

1. Policy Templates are provisioned in the 5GMSd AF.

12. The Media Player informs the 5GMS-Aware Application about the set of Service Descriptions associated with the Media Player Entry document for the content selected in step 3. Each Service Description is identified by a different *External reference*.

13. The 5GMSd-Aware Application selects one of the available Service Descriptions.

14. The Media Player provides the *External reference* of the selected Service Description to the Media Session Handler.

15. The Media Session Handler selects a Dynamic Policy with a matching *External reference*.

21. The Media Player provides Operation Point metrics to the Media Session Handler.

22. The Media Session Handler sends Service Operation Point measurements and events to the 5GMSd AF.

**===== CHANGE =====**

### 5.7.7 Use of Service Operation Point signalling to optimise delivery of low-latency live media streaming services (informative)

#### 5.7.7.1 5GMS System acts as a CDN

In this case, the specific aspects are as follows:

1. A provisioning agreement is struck between the 5GMSd Application Provider and the operator of the 5GMS System in the form of one or several Service Operation Points expressed as Service Descriptions and/or Policy Templates. (Service Descriptions may be derived from Policy Templates if the latter are omitted, or *vice versa*.)

2. DASH or HLS content is provided externally. Media Entry Point documents are annotated with Service Descriptions. The content is published to the 5GMS System for distribution over downlink media streaming.

3. Content is ingested by the 5GMSd AS at reference point M2d such that the latency requirements can be met.

4. The 5GMS System distributes the ingested content according to the provisioning agreement, i.e. meeting bit rate and latency requirements of the agreed Service Operation Point.

NOTE: The path between an (external) 5GMS Application Provider and the 5GMSd AS is subject to a separate transport-level agreement.

5. The Service Operation Point metrics collated by the 5GMSd AF are used by the 5GMS System to determine whether the agreed Service Operation Point has been satisfied, or whether the Policy Templates need to be adjusted so that it can be satisfied.

For low-latency streaming where the 5GMS System acts as a CDN, the basic call flow documented in clause 5.7.6 is extended as follows.

Extended steps:

1. Policy Templates suitable for supporting low-latency media streaming are provisioned in the 5GMSd AF.

2. Media ingest supports a low-latency protocol, e.g. segment content is provided in chunks.

14. 5GMSd-Aware Application selects a low-latency Service Description and provides its *External reference* to the Media Session Handler.

17. The Media Player configures itself for low-latency playback based on the low-latency Service Description selected in step 14.

21. The Media Player operates in a low-latency media delivery mode.

#### 5.7.7.2 5GMSd AS deployed in an external DN

In this case, the specific aspects are as follows:

1. A provisioning agreement is struck between the 5GMS Application Provider and the operator of the 5GMS System in the form of one or several Service Operation Points expressed as Service Descriptions and/or Policy Templates. (Service Descriptions may be derived from Policy Templates if the latter are omitted, or *vice versa*.)

NOTE: The path between the externally deployed 5GMSd AS and the 5G System may be subject to a separate transport-level agreement.

2. The 5GMSd AS external.

3. Content ingest by the 5GMSd AS is out of scope.

4. The 5GMS System distributes the content according to the agreed provisioning agreement, i.e. meeting bit rate and latency requirements of the agreed Service Operation Point.

5. The Service Operation Point metrics collated by the 5GMSd AF are used by the 5GMS System to determine whether the agreed Service Operation Point has been satisfied, or whether the Policy Templates need to be adjusted so that it can be satisfied.

For low-latency streaming where the 5GMSd AS is deployed in an external DN, the basic call flow documented in clause 5.7.6 is extended as follows.

Extended steps:

1. Policy Templates suitable for supporting low-latency media streaming are provisioned in the 5GMSd AF.

14. 5GMSd-Aware Application selects a low-latency Service Description.

17. The Media Player configures itself for low-latency playback based on the low-latency Service Description selected in step 14.

21. The Media Player operates in a low-latency media delivery mode.

**==== CHANGE =====**

### 5.10.7 Service URL handling procedures for 5GMSd via eMBMS in Receive-Only Mode (ROM)

In an extension to the procedures provided in clauses 5.10.2 and 9.1, this clause defines a call flow in order to initiate a 5GMSd streaming session delivered via eMBMS without needing to contact the network, for example as done in Receive-Only Mode (ROM).

The call flow in figure 5.13.2-1 extends those defined in clauses 5.10.2 and 9.1 to address 3GPP Service URL handling. Aspects specific to this use-case are indicated in bold.



Figure 5.10.2-1: High-level procedure for DASH content delivery via eMBMS with 3GPP Service URL

Prerequisites (step 0):

- The 5GMSd Application Provider has provisioned the 5GMSd System, including content ingest and the authorization to distribute 5GMSd content via eMBMS.

- The 5GMSd AF has informed the BM-SC about the availability of 5GMSd content by provisioning an MBMS service and has obtained relevant information from the eMBMS Service Announcement (such as the MBMS service identifier).

- **Based on the information, the 5GMSd Application Provider has generated a 3GPP Service URL with sufficient information for the Media Session Handler and MBMS Client to access the service.**

- The BM‑SC is ingesting content from the 5GMSd AS.

- The BM‑SC has broadcast the MBMS Service Announcement, including an indication that the content is 5GMSd content.

Steps:

1: The 5GMSd-Aware Application triggers the Service Announcement procedure and the 5GMS Service and Content Discovery procedure at reference point M8. **The information returned to the 5GMSd-Aware Application includes a 3GPP Service URL indicating a 5GMS-based service and also includes relevant information from the eMBMS Service Announcement (such as the MBMS service identifier).**

2: A media content item is selected.

3: The 5GMSd-Aware Application triggers the 5GMSd Client to start media playback**. The 3GPP Service URL describing the service is requested and the Media Session Handler handles it.**

4: **The Media Session Handler uses the Service URL information to extract relevant information from the eMBMS Service Announcement (such as the MBMS service identifier) in order to bootstrap reception of the MBMS service.**

**5: The Media Session Handler provides the Service Access information to the MBMS Client**.

Finally, the MBMS Service is launched as defined in steps 5–25 of clause 5.10.2.

**==== CHANGE =====**

## 6.9 Dynamic Policy selection for uplink media streaming based on Service Operation Point signalling

This clause provides an extension to the general call flow in clause 6.2.3 in order to address the usage of Service Descriptions to select a Dynamic Policy in uplink 5G Media Streaming services that supports the requirements of an abstract Service Operation Point. Details are shown in figure 6.9‑1.



Figure 6.9-1: High-level procedure for uplink media streaming
with Service Operation Point handling

Steps:

1. Policy Templates are provisioned in the 5GMSd AF and various configurations are performed.

2. Either the 5GMSu-Aware Application acquires Service Access Information from the 5GMSu Application Provider via reference point M8u, or else Service Access Information is acquired by the 5GMSu Client from the 5GMSu AF via reference point M5u (as defined in steps 7–11 of figure 6.2.2.2-1).

3. The 5GMSu Client acquires the Media Entry Point from the 5GMSu AS.

4. The 5GMSu Client processes the Media Entry Point to discover the set of available Service Descriptions, each one identified by a different *External reference*.

5. The 5GMSu Client notifies the 5GMSu Application about the available Service Descriptions.

6. The 5GMSu Application selects a Service Description and notifies the 5GMSu Client by supplying its *External reference*.

7. The 5GMSu Client selects a Dynamic Policy with a matching *External reference*.

8. The 5GMSu Client configures its capture and encoding according to the selected Service Description.

9. A transport session is established by the 5GMSu Client for uplink media streaming.

10. Media is streamed to the 5GMSu AS via the uplink.

**===== CHANGE =====**

# 9 Procedures for Service URL handling

## 9.1 Baseline procedure

The launch of a 5GMS session using a 3GPP Service URL is shown in figure 9.1-1. In this procedure, the Application is not assumed to be a 5GMS-Aware Application.



Figure 9.1-1 Baseline procedure for 3GPP Service URL Handling

The call flow is as follows:

1. The 5GMS Application Provider provisions media streaming services at reference point M1 and provides one or more *External service identifiers* to the 5GMS AF as part of the Provisioning Session.

2. The 5GMS Application Provider generates a unique 3GPP Service URL that includes one of the provisioned *External service identifiers*. Additional service announcement parameters, including a Media Entry Point URL, may also be embedded in this 3GPP Service URL.

3. The Application discovers the set of currently available media services at reference point M8.

4. The user selects a media service in the Application that is offered as a 3GPP Service URL.

5. The Application requests the 3GPP Service URL corresponding to the media service. If the Media Session Handler is available, it handles and resolves the URL.

NOTE: If the Media Session Handler is not available, the 3GPP Service URL request may be handled by the 5GMS AF as a fallback. In this case, the 5GMS AF may provide a Media Entry Point corresponding the 3GPP Service URL or reject the request.

6. The Media Session Handler may collect additional service parameters from the 5GMS AF. In particular, Service Access Information may be retrieved from the 5GMS AF using the *External service identifier* extracted from the 3GPP Service URL to identify the Provisioning Session of interest.

7. If the 3GPP Service URL requested in step 4 contains an embedded Media Entry Point URL, or if a Media Entry Point URL was obtained in step 5 or 6 the Media Session Handler launches the Media Stream Handler.

Alternatively, the Application may launch the Media Stream Handler directly itself using any Media Entry Point it obtained in preceding steps that is supported by the 5GMS Client.

8. Inter-Process Communication is established between the Media Stream Handler and the Media Session Handler.

9. Media streaming occurs between the Media Player, 5GMS AS and the 5GMS Application Provider.

**===== END OF CHANGES =====**