**3GPP TSG- Meeting # *S4-230907***

**Berlin, Germany, 22nd–26th May 2023** revision of S4aI230090

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

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

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** |  | | | | |  | ***Date:*** | | | 2023-05-16 |
|  |  | | | |  | |  | | |  |
| ***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 can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | A high-level description of 5G Media Streaming features is lacking. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | A high-level description of 5G Media Streaming features is added. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Poor understanding of specification. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.1, 4.0 (new), 4.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

**===== 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.

(SNIP)

**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.

(No further changes to clause 3.1)

**===== 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 | Functional 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 | Not defined |
| 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 | Not defined |
| Remote control | 4.0.7 | Not applicable | 6.6 |
| Consumption reporting | 4.0.8 | 5.6 | Not defined |
| QoE metrics reporting | 4.0.9 | 5.5 | Not applicable |

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.

## 4.0.3 Content publishing

The content publication feature is applicable to uplink media streaming only. High-level procedures for this feature are for future study.



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 preconfiguration 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, if suitably provisioned, is exposed by it to subscribing 5GMS Application Providers in the form of events.

## 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 Quality of Service for an ongoing media streaming session.



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

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.

## 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.

## 4.0.9 QoE metrics reporting

The QoE metrics reporting feature is applicable to both downlink media streaming only. 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.

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

## 4.1 General service architecture

(No further changes to clause 4.1)