**3GPP TSG- Meeting #**

**, , -** revision of S4-231316

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** | **0075** | **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:***  | Clarifications to Network Assistance feature |
|  |  |
| ***Source to WG:*** | Nokia, BBC, Dolby |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** | 5GMSA, TEI17 |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** | A |  | ***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)* |
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| ***Reason for change:*** | Some unclarities and missing inputs have been identified regarding the Network Assistance feature. |
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| ***Summary of change:*** | * Harmonize the use of the same terminology (i.e. throughput estimation, delivery boost) throughout clauses 4.0.5, as the rest of the document.
* A descriptive sentence is added in clause 5.9.1 to clarify the definition of the “recommended bit rate” concept.
* Clause 5.9.1 only applies to Network Assistance for downlink media streaming. A symmetric statement about uplink Network Assistance is added in clause 6.1.
* The missing interactions with the PCF added to the high-level Procedure in 6.5.
* Removal of the following requirement in Metrics Collection Process: *an error message shall be sent by the Media Session Handler to the appropriate network entity*.
* Change in Downlink network Assistance: *nominal time period* to *valid until further notice.*
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| ***Consequences if not approved:*** | * The definition of the Network Assistance feature is incomplete.
* Unclarities for implementers.
* 5GMS stage 2 and Stage 3 specifications are misaligned.
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| ***Clauses affected:*** | 4.0.5, 5.5.3, 5.9.1, 5.9.2, 6.1, 6.5 |
|  |  |
|  | **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:*** | S4-231316 -> S4-231415 |

FIRST CHANGE

### 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 6.1, 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 recommendation (or throughput 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. *Delivery 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 recommendation is also defined for downlink media streaming (see clause 5.9.3).

ANBR-based delivery 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 (see also clause 4.0.12).

NEXT CHANGE

### 5.5.3 5GMSd AF-based reporting procedure

The second use-case, shown in figure 5.5.3-1 below, illustrates a scenario where the metrics collection and reporting is configured by the 5GMSd AF. In this example, it is assumed that the metrics configuration provided by the 5GMSd AF comprises instructions/rules regarding metrics collection (i.e. measurement and logging) and reporting for two different schemes - one that is non-3GPP-defined and initially sourced from the 5GMSd AS, and the other scheme that is defined by 3GPP and initially sourced from an OAM Server belonging to the 5GMS System operator. Each metrics scheme requires the 5GMSd Client to perform metrics collection and subsequent metrics reporting to the 5GMSd AF according to the configuration rules of that scheme. Furthermore, it is assumed that the 5GMSd AF is required to deliver metrics reports obtained from the 5GMSd Client to separate destination entities, upon optionally having performed post-processing of the original report information, according to the configuration rules of each metrics scheme. The 5GMSd AF and 5GMSd AS functions can be either trusted or untrusted.



Figure 5.5.3-1: Metrics collection and reporting via 5GMSd AF-based configuration

The message sequence steps are described below:

1: The 5GMSd AF is provisioned with two separate sets of metrics reporting configuration information - metrics scheme\_1 as defined by the 5GMSd Application Provider and metrics scheme\_2 as defined by 3GPP, each pertaining to metrics collection by the Media Player, retrieval of those collected metrics from the Media Player by the Media Session Handler, and the generation and delivery of metrics reports from the Media Session Handler to the 5GMSd AF. The 5GMSd AF is similarly provisioned with two separate sets of metrics reporting configuration information, associated with the metrics schemes 1 and 2, regarding required post-processing functionality and subsequent and separate delivery of processed metrics reports to the 5GMSd Application Provider and to the OAM Server.

2: The 5GMSd-Aware Application triggers the Service Announcement and Content Discovery procedure. The Service Announcement includes the whole Service Access Information that contains metric configuration info for metrics schemes 1 and 2, with their associated metrics collection configurations acquired by the Media Player and metrics collection configurations acquired by the Media Session Handler.

3: Time passes until the 5GMSd UE initiates session establishment and media playback.

4: The 5GMSd-Aware Application informs the Media Player of impending media playback.

5a: The Media Player requests the establishment of a streaming session with the Media Session Handler which acknowledges the request.

5b: The Media Session Handler requests the establishment of a streaming session with the 5GMSd AF which confirms the streaming session establishment.

5c: The Media Session Handler informs the Media Player the successful set-up of the streaming session.

6: Media playback pipeline is set up between the Media Player, the 5GMSd AS and the 5GMSd Application Provider.

7: The Media Session Handler queries the Media Player on its capability to perform metrics collection (measurement and logging function) in accordance with both schemes 1 and 2 as defined by its metrics configuration.

8: The Media Player acknowledges its support for the collection of the required metrics of all configured schemes.

During the course of media playback, steps 9-18 below may be repeated, depending on the duration of the playback and the frequency of metrics reporting as set by the metrics configuration for each of the two schemes.

9: Assuming a live streaming service, media content is delivered via push ingest from the 5GMSd Application Provider to the 5GMSd AS.

10: The Media Player fetches media content from the 5GMSd AS and begins media playback.

11: The Media Player notifies the Media Session Handler of the start of media playback, causing the Media Session Handler to initialize and begin countdown of separate metrics reporting interval timers for schemes 1 and 2.

12: Upon expiration of timer\_1 (associated with scheme\_1), the Media Session Handler retrieves the logged metrics measurements from the Media Player according to scheme\_1.

13: In accordance with its metrics reporting configuration as provisioned in step 2, a metrics report for scheme\_1 is sent from the Media Session Handler to the 5GMSd AF.

14: Upon expiration of timer\_2 (associated with scheme\_2), the Media Session Handler retrieves the logged metrics measurements from the Media Player according to scheme\_2.

15: In accordance with its metrics reporting configuration as provisioned in step 2, a metrics report for scheme\_2 is sent from the Media Session Handler to the 5GMSd AF.

16: In accordance with its metrics reporting configuration as provisioned in step 1, the 5GMSd AF performs separate post-processing in accordance with schemes 1 and 2 (e.g. filtering, aggregation, reformatting) of the received types of metrics reports.

Furthermore, in accordance with its metrics reporting configuration as provisioned in step 1:

17: The 5GMSd AF sends a processed metrics report in accordance with scheme\_1 to the 5GMSd Application Provider.

18: The 5GMSd AF sends a processed metrics report in accordance with scheme\_2 to the OAM Server.

Upon the termination of media playback (as notified by the 5GMSd-Aware Application to the Media Player) a final round of metrics collection and reporting is performed:

19: The Media Session Handler obtains the latest metrics measurements from the Media Player in accordance with schemes 1 and 2. These procedures might occur prior to the nominal expiration of the metrics reporting interval timers.

20: Final metrics reports, in accordance with schemes 1 and 2 are sent by the Media Session Handler to the 5GMSd AF. These procedures might occur prior to the expiration of the nominal metrics reporting intervals.

21: The 5GMSd AF performs post-processing of the received final metrics reports in accordance with schemes 1 and 2.

22: Same as step 17.

23: Same as step 18.

NOTE: Although not explicitly shown or described in Figure 5.3.3-1, should the 5GMSd AF represent an untrusted network entity and the OAM Server represent a trusted network entity, the delivery of processed metrics reports from the 5GMSd AF to the OAM Server, as depicted in steps 18 and 23, must be mediated by the NEF (Network Exposure Function).

NEXT CHANGE

### 5.9.1 Introduction

The Network Assistance (NA) feature enables a UE that is receiving a downlink media stream to improve the QoE of the media streaming session, by being able to make use of two distinct facilities.

The first facility is **bit rate recommendation (throughput estimation)**. This enables the UE to start a downlink streaming session at the most appropriate bit rate for the network conditions at hand, or to obtain a recommendation from the network which will remain valid until further notice during a media streaming session. The recommended bit rate is based on network estimations or predictions of available link bandwidth. This function is provided as an additional tool to support the UE, in addition to the common approach of the UE performing its own estimation based on measurement of the downlink traffic in the past.

The second facility is the **delivery boost**. The 5GMSd Client uses this function to indicate to the network that a temporary boost, i.e., a temporary increase of network throughput for this client is needed in order to avoid the risk of media playback stalling due to buffer under-run, which could otherwise occur during the next media segment or soon after. Throughput boosting may also be used at the start of a playback session to shorten the time to start media playback, giving a better experience for the user.

Network Assistance for downlink media streaming may be offered to the UE in one of two ways:

- Based on interaction between the UE and the 5GMSd AF, with a subsequent interaction between the 5GMSd AF and the PCF (or the NEF);

- Based on interaction between the UE and the RAN, re-using the ANBR-based RAN signalling.

The UE shall not use both approaches on the same Network Assistance session.

Figure 5.9.1-1 depicts the Network Assistance feature in the context of the 5GMS architecture, showing the scope of both approaches.



Figure 5.9.1-1: Downlink Network Assistance alternative approaches

NEXT CHANGE

### 5.9.2 5GMSd AF-based downlink Network Assistance

The Network Assistance (NA) feature enables a UE to receive a bit rate recommendation from the 5GMSd AF that provides the NA server function. The 5GMSd AF provides the response with an estimation of throughput, or the recommend­ation of a bit rate which will remain valid until further notice. The UE uses this estimation to derive the most suitable bit rate for its downlink content session from the versions that might be available. The network is expected to commit resources to be able to fulfil the recommendation, although no guarantee for the bandwidth estimation can be assumed. The 5GMSd Client may provide additional information, such as available media versions, in terms of the required bit rates, to the 5GMSd AF.

The second facility is the delivery boost. The 5GMSd Client uses this function to indicate to the network that a temporary boost, i.e., a temporary increase of network throughput for this client, is needed.

Each interaction for the 5GMSd AF-based downlink Network Assistance procedures consists of two steps in sequence:

1. Between the UE (Media Session Handler) and the 5GMSd AF using a 5GMS API at interface M5d;

2. Between the 5GMSd AF and the PCF (or the NEF):

- using the Npcf\_PolicyAuthorization procedure or Nnef\_AFSessionWithQoS procedure to request modification of the PDU session with the requested QoS information.

- using the Npcf\_PolicyAuthorization notification service or Nnef Monitoring Event procedure to receive QoS changes. The 5GMSd AF receives these policy change notifications asynchronously.

Network Assistance is performed within dedicated NA sessions that are a part of the Media Session Handler procedures. Only 5GMSd Clients that have been granted an NA session by the 5GMSd AF may execute the NA bit rate recommendation and boost request procedures. This enables the 5GMSd AF to enforce policies that could include the access to NA by certain 5GMSd Clients only, such that authorisation to use NA facilities can be verified once at the granting of an NA session, and does not need to be verified for each NA request from the 5GMSd Client.

The procedures for 5GMSd AF-based downlink Network Assistance are:

1. NA session initiation. The 5GMSd Client requests to initiate an NA session with the 5GMSd AF. If the request fulfils any pre-requisites for access to NA functionality, for example policy and charging, then the 5GMSd AF responds with a confirmation that the NA session has been established.

2. NA throughput estimation. The 5GMSd Client requests a throughput estimation for a downlink media session from the 5GMSd AF. A unique identifier for the downlink media session is provided by the 5GMSd Client.

 If the set of available bit rates in the downlink media session is provided with the request then the 5GMSd AF responds with the recommended bit rate based on its throughput estimation. If the throughput estimation is lower than the lowest value from the set of available bit rates, then the actual throughput estimation is provided.

 If no set of available bit rates is provided with the request then the 5GMSd AF responds with the throughput estimation.

3. NA delivery boost. The 5GMSd Client requests from the AF a downlink delivery boost. A unique identifier for the downlink media session is provided by the 5GMSd Client.

4. NA session termination. The 5GMSd Client requests to terminate an NA session with the 5GMSd AF. The unique identifier of the NA session to be terminated is provided by the 5GMSd Client.

The AF responds positively if the indicated session could be terminated, and negatively otherwise.

NEXT CHANGE

## 6.1 General

The procedures for uplink media streaming allow a system user to create, modify, establish and delete sessions. Uplink media streaming sessions exist between a 5GMSu Client and a 5GMSu AS. The term **Sink Configuration** refers to the provisioned parameters of a 5GMSu AS. The term **Source Session** refers to the provisioned parameters in the 5GMSu Client.

The uplink streaming procedures follow a general high-level workflow, starting from provisioningto the actual uplink streaming sessions. The egest session refers to the time during which media content is uplink streamed into the 5GMSu AS. The provisioning session refers to the time period during which the 5GMSu Client is permitted to uplink stream media content. Interactions between the 5GMSu AF and the 5GMSu Application Provider may occur at any time while the Provisioning Session is active.

The 5GMSu Provisioning API allows selection of Media Session Handling (M5u) and Uplink Streaming (M4u) options, including whether the media content is published to trusted 5GMSu AS instances. The 5GMSu AF selects the M5u interface according to the provisioning option. The Media Session Handling interface exposed by the 5GMSu AF can be used for remote control, metrics reporting, requesting different policy and charging treatments, or 5GMSu AF-based Network Assistance.

When the 5GMSu AF and AS are in the same DN, then the 5GMSu AF selects the 5GMSu AS. Interactions between a 5GMSu AF and a 5GMSu AS (M3u interactions) take place for 5GMS Egest (M2u) and Uplink Streaming (M4u) resource reservations. The 5GMSu AS allocates M2u and M4u resources and communicates resource identifiers back to the 5GMSu AF. The 5GMSu AF provides information about the provisioned resources (in the form of resource identifiers) for Media Session Handling, Egest and Uplink Streaming to the 5GMSu Application Provider. The resource identifiers for Media Session Handling and Uplink Streaming are needed by the 5GMSu Client to access the selected features.

When 5GMSu AF and 5GMSu AS are operated by different providers, then the M3u interface is not used and the 5GMSu AF does not provide 5GMS Egest (M2u) and Uplink Streaming (M4u) resource reservations. M3u procedures are not specified.

5GMSu Client can (in principle) start the uplink streaming by activating its uplink streaming session. The uplink streaming session for a given UE (or for each UE) is active from the time at which the 5GMSu-Aware Application activates the transmission of an uplink streaming service until its termination.

The 5GMSu-Aware Application receives application metadata from the 5GMSu Application Provider before transmitting the uplink streaming media. The application metadata contains Service Access Information, which acts as an entry point for the 5GMSu Client to start the uplink streaming session. The 5GMSu Client may either receive the Service Access Information from the 5GMSu Application Provider (using a not standardized interface) or instructions for a remote control session. When remote control is activated, then the 5GMSu Client is remotely configured and controlled by a 5GMSu AF.

The Network Assistance (NA) feature enables a UE that is receiving a uplink media stream to improve the QoE of the media streaming session, by being able to make use of two distinct facilities.

The first facility is **bit rate recommendation (throughput estimation)**. This enables the UE to start a uplink streaming session at the most appropriate bit rate for the network conditions at hand, or to obtain a recommendation from the network which will remain valid until further notice during a media streaming session. The recommended bit rate is based on network estimations or predictions of available link bandwidth. This function is provided as an additional tool to support the UE, in addition to the common approach of the UE performing its own estimation based on measurement of the uplink traffic in the past.

The second facility is the **delivery boost**. The 5GMSu Client uses this function to indicate to the network that a temporary boost, i.e., a temporary increase of network throughput for this client is needed, for example in order to prevent the uplink media streaming buffer in the Media Streamer from overflowing.

Network Assistance for uplink media streaming may be offered to the UE in one of two ways:

- Based on interaction between the UE and the 5GMSu AF, with a subsequent interaction between the 5GMSu AF and the PCF (or the NEF), as defined in clause 6.5.

- Based on interaction between the UE and the RAN, re-using the ANBR-based RAN signalling as defined in clause 6.7.

The UE shall not use both approaches on the same Network Assistance session.



Figure 6.1-1: High Level Procedure for uplink streaming

Steps:

1. The 5GMSu Application Provider creates a Provisioning Session 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 5GMSu Application Provider receives Service Access Information for M5u (Media Session Handling) and, when media content reception is negotiated, Service Access Information for M2u (Egest) and M4d (Uplink Streaming). This information is needed by the 5GMSu Client to access the service. Depending on the provisioning, only Remote Configuration information may be provided.

2. When the 5GMSu AF and the 5GMSu AS are operated by the same provider (e.g. the MNO), there may be interactions between the 5GMSu AF and 5GMSu AS, e.g. to allocate 5GMSu egest and uplink streaming resources. The 5GMSu AS provides resource identifiers for the allocated resources to the 5GMSu AF, which then provides the information to the 5GMSu Application Provider. The M3u procedures between 5GMSu AF and 5GMSu AS are not specified.

3. The 5GMSu Application Provider provides the Service Announcement Information to the 5GMSu-Aware Application.

NOTE: This may include manual entering of parameters.

 The Service Announcement includes either the whole Service Access Information (i.e. details for Media Session Handling (M5u) and for Media Streaming access (M4u)) or only a remote configuration and control address (5GMSu AF URL). In the latter case, the 5GMSu Client retrieves the Services Access Information in a later step.

4. The 5GMSu-Aware Application configures and starts the 5GMSu Client.

5. When the 5GMSu-Aware Application decides to activate the streaming service transmission, the Service Access Information is provided to the 5GMSu Client. When remote configuration and control is activated, then the 5GMSu AF configures and controls the 5GMSu Client remotely.

6. Depending on the configurations, the 5GMSu Client uses the Media Session Handling API towards the 5GMSu AF. The Media Session Handling API is used for requesting different policy and charging treatments or 5GMSu AF-based Network Assistance.

7. The 5GMSu Client starts the Egest Session by activating the uplink streaming session.

8. The 5GMSu AS publishes the content towards the 5GMSu Application Provider.

last CHANGE

## 6.5 Providing 5GMSu AF-based Network Assistance

The procedure a 5GMSu Client uses to obtain network assistance from a 5GMSu AF is defined in figure 6.5‑1 below.



Figure 6.5-1: Providing 5GMSu AF-based Network Assistance

Steps:

1: An uplink streaming session is active. A Network Assistance Session is established with the 5GMSu AF.

2: The Media Session Handler in the 5GMSu Client requests assistance information from the 5GMSu AF.

2a: The 5GMSu AF interacts with the PCF (or, if the AF is deployed outside the Trusted DN, with the PCF via the NEF) to obtain the requested assistance information.

3: The assistance information is returned to the Media Session Handler in the 5GMSu Client.

4: The Media Streamer in the 5GMSu Client takes an appropriate action based on the information received.

END OF CHANGES