**3GPP TSG-S4 Meeting #126*****S4-231984***

**Chicago, USA, 13-17 November 2023** revision of *S4-231658*

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **26.501** | **CR** | **0081**  | **rev** |  **1** | **Current version:** | **18.3.1** |  |
|  |
| *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:***  |  for uplink streaming |
|  |  |
| ***Source to WG:*** | Tencent Cloud |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** | 5GMS\_Ph2 |  | ***Date:*** | 2023-11-03 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-18 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | Document expansion of scope in Rel-18 to include complete support for dynamic policies invocation for uplink streaming |
|  |  |
| ***Summary of change:*** | 1. 4.3.2: adding dynamic policy to UE list of features for uplink streaming.
2. 6.9 (new): Added call flow sequence diagram and description for:
3. 6.9.1 general description of dynamic policy
4. 6.9.2 provisioning
5. 6.9.3 uplink streaming call flow w/ invocation of dynamic policies.
6. 6.9.4 parameters
7. 6.9.5 dynamic policy selection based on operation points (previously 6.9)
8. 6.9.6 dynamic policy based on network slicing.
9. 6.9.7 background data transfer using dynamic policy.
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|  |  |
| ***Consequences if not approved:*** | The dynamic policy features for uplink streaming is not sufficiently well described at stage‑2. |
| ***Q*** |  |
| ***Clauses affected:*** | 4.3.2, 6.9 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications |  |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

FIRST 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: Uplink 5G Media Streaming UE 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.

- **Dynamic Policy:** involves interacting with the 5GMSu AF to instantiate Policy Templates that change the network Quality of Service for an uplink media streaming session. Policy Templates may be selected based on interactions with the Media Streamer.

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

**- Service URL Handling:** a UE function that handles 3GPP Service URLs (see clause 4.10) 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.

Next change

## 6.9 Establishing an uplink streaming session with 5GMSu AF interactions for dynamic policy invocation and updates

### 6.9.1 General

This clause describes the procedures for provisioning Policy Templates and the establishment of uplink streaming session using dynamic policy invocation. The establishment of the uplink streaming session uses 5GMSu AF interactions, as described in clause 6.1. The Dynamic Policy feature allows separate handling of Service Data Flows within the same PDU Session. The Media Session Handler provides a Policy Template Id together with Service Data Flow Descriptions when requesting a dynamic policy. An example Policy Template Id value is "background\_data".

The Media Session Handler provides needed information to the 5GMSu AF, so that the 5GMSu AF can combine the semi-static parameters from a Policy Template (which is associated with the Policy Template Id) with parameters supplied dynamically by the Media Session Handler to trigger a dynamic PCC rule update using the NEF or PCF.

The 5GMSu AF may trigger, for example, the "AF session with required QoS procedure" (see clause 4.15.6.6 of TS 23.502 [3]) to update QoS-related dynamic PCC rules. For changing charging-related rules, the 5GMSu AF may trigger the "Change the chargeable party during the session" procedure (see clause 4.15.6.5 of TS 23.502 [3]).

### 6.9.2 Provisioning

The provisioning for the dynamic policy procedure follows the general procedure from clause 6.2.2. Specifically, the Dynamic Policy feature is activated and, as result, the 5GMSu Application Provider is able to provision one or more Policy Templates.

The domain model of M1u and M5u APIs is depicted in figure 6.9.2-1. Realization of the dependencies between M1u and M5u data entries are up to implementation.

NOTE: Multiple M5u 5GMSu AF nodes may reference the same M1u resource.



Figure 6.9.2-1: Domain model for dynamic policies for uplink streaming

A Policy Template is identified by a Policy Template Id and contains semi-static parameters, including the API entry for the PCF/NEF interactions. The list of provisioned Policy Template Ids is communicated as valid Policy Template Ids to the Media Session Handler. The Media Session Handler uses one of the valid Policy Template Ids when invoking a dynamic policy.

### 6.9.3 Uplink streaming with dynamic policy invocation

This procedure describes the establishment of an uplink streaming session with 5GMSu AF interactions for dynamic policy invocation.



Figure 6.10.3-1: High-level procedure for uplink media streaming session
with dynamic policy invocation

Steps:

1. The 5GMSu Application Provider authenticates and provisions the 5GMS System for uplink media streaming.

2. The 5GMSu Application Provider provides the Service Access Information to the 5GMSu-Aware Application via reference point M8u, or alternatively the 5GMSu Client acquires the Services Access Information from 5GMSu AF via reference point M5u.

Then:

**3. The 5GMSu Client requests that a dynamic policy is applied to the media streaming session. The request includes at least the Provisioning Session identifier, the Service Data Flow Description(s) and the Policy Template identifier (see figure 6.9.2-1), to be applied to the described transport session. In some cases, a QoS specification is also provided, containing desired QoS information. The 5GMSu AF uses the Policy Template for the related procedure and to identify the related network function.**

**NOTE: The 5GMSu Client may add and remove Service Data Flow description(s) from the dynamic policy during the lifetime of the uplink media streaming session.**

**4. This step applies when the 5GMSu AF resides in the trusted Data Network. Depending on the Policy Template, the step is executed either:**

**a. When the Policy Template relates to QoS, the 5GMSu AF may either directly interact with the PCF or may use a NEF service:**

**- when directly interacting with the PCF, the 5GMSu AF uses the Npcf\_PolicyAuthorization service as defined in clause 5.2.5.3 of TS 23.502 [3]).**

**- when interacting via the NEF with the PCF, continue at step 5a.**

**b. When the Policy Template relates to a different charging scheme, the 5GMSu AF may either directly interact with the PCF or may use a NEF service:**

**- when directly interacting with the PCF, the 5GMSu AF uses the Npcf\_PolicyAuthorization service as defined in clause 5.2.5.3 of TS 23.502 [3]).**

**- when interacting via the NEF with the PCF, continue at step 5b.**

**5. This step applies when the 5GMSu AF resides in the external Data Network. Depending on the Policy Template, the step is executed either:**

**a. When the Policy Template relates to QoS, the 5GMSu AF uses the Nnef\_AFsessionWithQoS service as defined in clause 5.2.6.9 of TS 23.502 [3]. (The complete call flow is described in clause 4.15.6.6 of TS 23.502 [3].)**

**b. When the Policy Template relates to a different charging scheme, the 5GMSu AF uses the Nnef\_ChargeableParty service as defined in clause 5.2.6.8 of TS 23.502 [3]. (The complete call flow is described in clause 4.15.6.4 and 4.15.6.5 of TS 23.502 [3].) The Policy Template may contain Sponsor Information (values based on SLA negotiation) and a Background Data Transfer Reference ID. The Flow Description is provided by the Media Session Handler at API invocation.**

**6. The response to step 3 from the 5GMSu AF contains status information (policy accepted, rejected, etc) and information on policy enforcement such as the enforcement method and enforcement bit rate.**

7. The 5GMSu Client streams the content to the 5GMSu AS via reference point M4u.

8. When content publishing is offered and has been selected in step 1, the content contributed to the 5GMSu AS in the previous step is made available to the 5GMSu Application Provider via reference point M2u.

Optionally:

9. The 5GMSu Application Provider may update the Provisioning Session.

According to schedule, or upon request by the 5GMSu-Aware Application:

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

### 6.9.4 Parameters for dynamic policy invocation configuration

Table 6.10.4-1: Status information dynamic policy

|  |  |
| --- | --- |
| **Parameters** | **Description** |
| Policy Enforcement | Information about the policy enforcement system. |

### 6.9.5 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 6.9.5‑1.



Figure 6.9.5-1: 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.

### 6.9.6 Dynamic Policy based on Network Slicing for uplink media streaming

The 5GMSu Application Provider requests the assignment of more than one network slice for the uplink media streaming service. The 5GMSu Application Provider indicates the desired network slice features that correspond to the Service Access Information. Upon successful assignment of the network slices for the service, the 5GMSu AF shall respond with the list of allowed S-NSSAIs to the 5GMSu Application Provider.

Figure 6.9.6-1 is the sequence diagram for this procedure.



Figure 6.9.6-1.: Dynamic Policy based on Network Slicing for uplink streaming

Pre-requisites:

1. The UE knows how to access the network slice(s) associated with a particular Provisioning Session.

2. The 5GMSu AS instance(s) serving the content for the particular Provisioning Session are accessible through the DNN(s) associated with the network slice(s) provisioned for the contribution of that content.

The steps are as follows:

1. The 5GMSu-Aware Application triggers the 5GMSu Client for uplink media streaming of content.

2. If it has not already been provided with the necessary Service Announcement parameters by the 5GMSu-Aware Application in the previous step, the Media Session Handler in the 5GMSu Client retrieves Service Access Information from the 5GMSu AF for the Provisioning Session of interest.

**3. The Media Session Handler in the 5GMSu Client invokes Network Assistance on the 5GMSu AF and receives information in response to assist it with the route selection for the uplink media streaming session. This may include information about the network slices, the DNNs and any pre-authorized QoS guarantees for that Provisioning Session.**

**4. The 5GMSu Client and the UE Policy Management in the UE perform the route selection procedure using information such as the uplink streaming Service Operation Point and the traffic descriptors. The UE Policy Management uses the matching filter to retrieve the Route Selection descriptor, which provides the DNN and the S-NSSAI(s) identifying the network slice(s) to be used for uplink media streaming sessions associated with this Provisioning Session.**

**5. The UE either reuses an existing PDU Session with the selected S-NSSAI and DNN from step 3 or, if one doesn't exist already, it requests the establishment of a new PDU Session with the identified parameters.**

6. The 5GMSu Client contributes media content to the 5GMSu AS at reference point M4u using the PDU Session selected in the previous step and this content is made available to the 5GMSu Application Provider at reference point M2u.

### 6.9.7 Uplink Background Data Transfer using dynamic policy invocation

Figure 6.9.7‑1 shows a high-level call flow for the configuration and usage of a Background Data Transfer session in uplink 5G Media Streaming:



Figure 6.9.7-1: Call flow for uplink Background Data Transfer
session configuration and establishment

Pre-requisites:

1. The 5GMSu Application Provider has negotiated a Service Level Agreement with the 5GMS System operator that includes all or some of the following:

a. Time window(s) when Background Data Transfers are available. These may recur on a regular pattern (e.g., daily, weekly, monthly, etc.).

b. A quota for the maximum number of 5GMS Clients that may avail themselves of a Background Data Transfer during each such time window.

c. A quota for the maximum aggregate volume of data that may be transferred by all 5GMS Clients during each Background Data Transfer window.

2. The 5GMS System operator may have provisioned a Background Data Transfer Policy in the PCF based on the Service Level Agreement, in which case it may share the corresponding Background Data Transfer reference identifier directly with the 5GMSu Application Provider.

The steps in the call flow sequence are as follows with differences from the baseline call flow highlighted in **bold**:

1. The 5GMSu Application Provider provisions a Policy Template in the 5GMSu AF at reference point M1u including network QoS parameters **that either references an existing Background Data Transfer policy already provisioned in the PCF that embodies the aforementioned Service Level Agreement or else directly specifies Background Data Transfer parameters in line with the aforementioned Service Level Agreement**.

2. **If the supplied Policy Template explicitly declares new Background Data Transfer parameters, the 5GMSu AF creates a corresponding new Background Data Transfer policy in the PCF based on them using the Npcf\_BDTPolicyControl service (or, if the 5GMSu AF is deployed outside the Trusted DN, the Nnef\_BDTPNegotiation service (see clause 4.16.7.2 of TS 23.502 [3]). The PCF may interact with the UDR as a consequence. The procedure yields a Background Data Transfer reference identifier.**

3. The 5GMSu AF acknowledges successful creation of the Policy Template to the 5GMSu Application Provider. This confirms that the parameters of the Policy Template **(including the Background Data Transfer parameters)** are acceptable to the 5GMS System.

4. If it has not already done so, the 5GMSu AF subscribes to receive Background Data Transfer warning notifications from the PCF as defined in clause 4.16.7 of TS 23.502 [3].

At some later point in time:

5. The 5GMSu-Aware Application launches media session handling using an appropriate service launch mechanism at reference point M6u.

6. In response, the Media Session Handler fetches Service Access Information from the 5GMSu AF for the relevant Provisioning Session via reference point M5u. A client dynamic policy invocation configuration is provided that describes the Policy Templates applicable to the requesting 5GMSu Client, **including information about Background Data Transfer windows and endpoint(s) that the Media Session Handler may subscribe to in order to receive Background Data Transfer warning notifications from the 5GMSu AF**.

7. **The 5GMSu-Aware Application also subscribes to receive notifications of Background Data Transfer opportunities from the Media Session Handler by invoking a client API on the latter at reference point M6u.**

At the start of the next Background Data Transfer window:

8. According to its list of current subscriptions **(see step 7)**, t**he Media Session Handler notifies its 5GMSu-Aware Application subscriber(s) of the Background Data Transfer opportunity by sending a notification to each one via reference point M6u. The notification indicates the time window of the Background Data Transfer opportunity.**

9. **If it wishes to avail itself of the Background Data Transfer opportunity (immediately or at some later point during the time window indicated in the previous step) a 5GMSu-Aware Application that has received such a notification invokes a suitable client API on the Media Session Handler at reference point M6u. The invocation includes an estimate of the data volume the 5GMSu Client intends to transfer in the background.**

10: The Media Session Handler instantiates a dynamic policy resource on the 5GMSu AF based on one of the Policy Templates advertised in the Service Access Information **that includes Background Data Transfer parameters. The request includes an estimate of the data volume the 5GMSu Client intends to transfer in the background.**

**11. If the request falls within a time window for Background Data Transfers advertised in the Service Access Information and if the quota for the number of Background Data Transfers within the current time window has not been exceeded, the Media Session Handler requests a change to the network QoS of the appropriate PDU Session by invoking the Npcf\_PolicyAuthorization\_Create operation (either directly or via the NEF) according to clause 4.16.7.1 of TS 23.502 [3] based on the Background Data Transfer parameters described in the appropriate Policy Template and citing the reference identifier of the Background Data Transfer referenced in step 1 or created in step 2.**

**12. The 5GMSu AF responds to the Media Session Handler to grant the Background Data Transfer request. The grant response includes a recommendation from the 5GMSu AF of the maximum time period for which the Background Data Transfer is available and the maximum Background Data Transfer volume granted for the media streaming session during this grant period (which may be smaller than that requested in step 10).**

**13. The Media Session Handler informs the 5GMSu-Aware Application of the Background Data Transfer grant by sending a synchronous response or asynchronous notification to the latter at reference point M7u. This conveys the maximum time period recommendation and maximum data volume indicated by the 5GMSu AF in the previous step.**

14: **The 5GMSu-Aware Application subscribes to receive Background Data Transfer warning notifications from the Media Session Handler by invoking a client API on the latter at reference point M6u.**

15. **As a consequence, the Media Session Handler subscribes to receive Background Data Transfer warning notifications from the 5GMSu AF by invoking a network API on the latter at reference point M5u. The subscription endpoint(s) are indicated in the Service Access Information obtained in step 6.**

The following steps are repeated for each content item the 5GMSu-Aware Application would like to download during the granted time period for Background Data Transfers:

**16. The 5GMSu-Aware Application initiates download of a content item in the background by invoking a suitable client API on the Media Player at reference point M7u. The content is identified by a URL that is available on a 5GMSu AS.**

**17. The Media Streamer uploads the content item from the 5GMSu AS at reference point M4d using the content item URL supplied in the previous step.**

**18. The Media Player confirms that the content item has been successfully uploaded by sending a notification to the 5GMSu-Aware Application at reference point M7u.**

(Steps 19–27 are described below.)

When the granted time period for Background Data Transfers subsequently expires:

**28. The PCF automatically reverts the network QoS of the media streaming session to its state prior to the Background Data Transfer grant without intervention from the 5GMS System.**

At any time during a Background Data Transfer window the PCF may detect that the network cannot satisfy the requirements of the Background Data Transfer policy at the UE’s current location (as defined in clause 6.1.2.4 of TS 23.503 [4]) or that the volume of data transferred by all UEs in the current Background Data Transfer window has exceeded the quota provisioned in the Background Data Transfer policy. The procedures in this case are summarised in figure 6.9.7‑2.



Figure 6.9.7-2: Call flow for uplink Background Data Transfer session renegotiation/cancellation

The steps are as follows:

**19: If it is able to identify alternative Background Data Transfer policies, the PCF sends a Background Data Transfer warning notification with these candidates to the 5GMSu AF as defined in clause 4.16.7.3 of TS 23.502 [3].**

**20: The 5GMSu AF evaluates the candidate alternative Background Data Transfer policies for suitability.**

If the 5GMSu AF determines that one of the candidate alternative Background Data Transfer policies suggested by the PCF is suitable for the media streaming session in question:

**21: The 5GMSu AF requests that its chosen alternative Background Data Transfer policy is applied, according to step 12 in clause 4.16.7.3 of TS 23.502 [13]. As defined in clause 6.1.2.4 of TS 23.503 [4], in this case the current Background Data Transfer policy remains in force until its natural end (see step 29 above).**

**22. Using an asynchronous notification mechanism at reference point M5u, the 5GMSu AF notifies the Media Session Handler of the modified Background Data Transfer grant, including the new maximum time period for which the Background Data Transfer is available, and the new maximum Background Data Transfer volume granted for the media streaming session during this grant period (which may be smaller than that requested in step 10).**

**23: The Media Session Handler informs the 5GMSu-Aware Application of the Background Data Transfer grant by sending an asynchronous notification to the latter at reference point M6u. This conveys the maximum time period recommendation and maximum data volume indicated by the 5GMSu AF in the previous step.**

Otherwise, if none of the candidate Background Data Transfer policies suggested by the PCF deemed suitable by the 5GMSu AF:

**24: The 5GMSu AF informs the PCF that none of the candidate Background Data Transfer policies is suitable, according to step 13 in clause 4.16.7.3 of TS 23.502 [13].**

**25: Using an asynchronous notification mechanism at reference point M5u, the 5GMSu AF notifies the Media Session Handler that the Background Data Transfer window has ended prematurely.**

**26: Using an asynchronous notification mechanism at reference point M6u, the Media Session Handler notifies the 5GMSu-Aware Application that the Background Data Transfer window has ended prematurely.**

**27: As a consequence, the 5GMSu-Aware Application may choose to cancel an in-progress Background Data Transfer by invoking a suitable client API method on the Media Player at reference point M7u.**

END OF CHANGES