**3GPP TSG- Meeting #124 *S4-230806r2***

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** | **4** | **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 |  |

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| ***Title:***  |  |
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| ***Source to WG:*** |  |
| ***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)* |
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| ***Reason for change:*** | The feature of data collection and reporting for Network Assistance allows the reporting only of AF-based Network Assistance usage. |
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| ***Summary of change:*** | Add the data collection and reporting of Network Assistance usage when the UE implements the ANBR-based Network Assistance method. |
|  |  |
| ***Consequences if not approved:*** | Data collection and reporting for Network Assistance remains limited to the reporting only of AF-based Network Assistance usage. |
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| ***Clauses affected:*** | 4.2.2, 4.7, D.6 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Rev - : S4-230243 for SA4 #122.Rev 1: S4-230323 at SA4 #122, taking the comments from the BBC into account, and merging in S4-230244 (changes in Annex D.6). Known issues still to be covered:* Downlink and uplink reporting procedures at R2 still to be drafted (in TS 26.531?)
* Not directly related correction to figure 4.2.2-2 - change the label “Network Assistance and QoS” to “Network Assistance and QoS, & reporting”

S4-230323 was endorsed at SA4 #122 closing plenary.Rev 2: S4-230484 for SA4 #123-e – withdrawnRev 3: S4aI230101 for MBS SWG ad hoc meeting on 11th May 2023.Rev 4: S4-230806 for SA4 #124.S4-230806 🡪 r1, r2 - taking into account comments, and additions from BBC. |

### 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. This function also includes the logging of ANBR-based Network Assistance invocations and their reporting via reference point R2, as defined in clause 4.7.1.

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.

## 4.7 Data collection, reporting and exposure for 5GMS

### 4.7.1 Reference architecture instantiation

The abstract data collection and reporting architecture defined in clause 4 of TS 26.531 [22] and depicted in figure 4.2‑1 of TS 26.531 [22] is instantiated in the 5G Media Streaming architecture as shown in figure 4.7.1‑1 and as defined below.



Figure 4.7.1‑1: Data collection and reporting architecture instantiation for 5G Media Streaming

The functional elements in this instantiation are defined as follows:

- The role of the *Application Service Provider* in the abstract architecture is played by the 5GMS Application Provider.

- The *Data Collection AF* for 5G Media Streaming is instantiated in the 5GMS AF.

- The *Direct Data Collection Client* for 5G Media Streaming is instantiated in the Media Session Handler. This takes logical responsibility for the UE data collection activities of the *Metrics Collection & Reporting* and *Consumption Collection & Reporting* subfunctions and the subsequent reporting of this UE data via reference point M5. It also takes logical responsibility for thelogging of ANBR-based Network Assistance invocations by the *Network Assistance* subfunction and their subsequent reporting to the Data Collection AF instantiated in the 5GMS AF via reference point R2.

- The *Provisioning AF* of the Application Service Provider is not instantiated in the 5GMS architecture. Data collection and reporting is instead provisioned using the procedures defined in the present document.

- The *Indirect Data Collection Client* is not instantiated in the 5GMS architecture. Indirect reporting of UE data is outside the scope of 5G Media Streaming.

- The role of the *AS* data collection client in the abstract reference architecture is played by 5GMS AS. This may be deployed as a trusted AS within the 5G System or deployed externally.

- The *Event Consumer AF* is instantiated in the 5GMS Application Provider as a consumer of 5G Media Streaming events from the Data Collection AF.

The reference points as defined as follows in this instantiation:

**R1** This reference point is not instantiated in the 5GMS architecture.

**M1** Provisioning of data collection and reporting features in the Data Collection AF.

**R2** Direct data reporting by the Direct Data Collection Client to the Data Collection AF of ANBR-based Network Assistance invocations.

For the provision of QoE metrics and consumption reports, R2 is instead logically realised by the combination of the following components:

- Internal interfaces between the Direct Data Reporting Client and its subordinate functions, namely Metrics Collection & Reporting and Consumption Reporting & Reporting.,

- Internal interface between the Media Session Handler and its subordinate Direct Data Collection Client function.

- Reference point M5, as defined below.

- Internal interface between the 5GMS AF and its subordinate Data Collection AF function.

**M5** Direct data reporting by the Direct Data Collection Client to the Data Collection AF, via the Media Session Handler and 5GMS AF.

**R3** This reference point is not instantiated in the 5GMS architecture.

**R4** Media streaming access reporting by the 5GMS AS to the Data Collection AF.

**R5** Event exposure by the Data Collection AF to subscribing NWDAF [23] instances.

**R6** Event exposure by the Data Collection AF to subscribing Event Consumer AF instances in the 5GMS Application Provider.

**R7** This reference point is not instantiated in the 5GMS architecture.

**M6** Configuration of 5GMS-related data reporting by the 5GMS-Aware Application.

**R8** This reference point is not instantiated in the 5GMS architecture.

### 4.7.2 UE data reporting for 5GMS

#### 4.7.2.1 UE data reporting procedures for downlink media streaming

The following UE data reporting procedures are in scope for the instantiation of the abstract data collection and reporting architecture in the downlink 5GMS architecture:

1. The procedures defined in clause 5.5 shall be used by the Direct Data Collection Client instantiated in the Media Session Handler to report *QoE metrics for downlink media streaming* to the Data Collection AF instantiated in the 5GMSd AF.

2. The procedures defined in clause 5.6 shall be used by the Direct Data Collection Client instantiated in the Media Session Handler to report *consumption of downlink media streaming* to the Data Collection AF instantiated in the 5GMSd AF.

3.- Invocations of the *downlink dynamic policy* procedures defined in clause 5.8 shall be logged by the 5GMSd AF and reported to its subordinate Data Collection AF.

4. Invocations of the *AF-based downlink Network Assistance* procedures defined in clause 5.9.2 shall be logged by the 5GMSd AF and reported to its subordinate Data Collection AF using the procedure defined in clause 4.7.4.3.

5. The procedures defined in clause 5.11.1 and 5.11.2 shall be used by the 5GMSd AS to report *downlink media streaming access* *activity* to the Data Collection AF instantiated in the 5GMSd AF via reference point R4.

6. The procedures defined in clause 4.7.4.4 shall be used by the Direct Data Collection Client instantiated in the Media Session Handler to report invocations of the *ANBR-based downlink Network Assistance* procedures to the Data Collection AF instantiated in the 5GMSd AF via reference point R2.

#### 4.7.2.2 UE data reporting procedures for uplink media streaming

The following UE data reporting procedures are in scope for the instantiation of the abstract data collection and reporting architecture in the uplink 5GMS architecture:

1. Invocations of the *AF-based uplink Network Assistance* procedures defined in clause 6.5 shall be logged by the 5GMSu AF and reported to its subordinate Data Collection AF using the procedure defined in clause 4.7.4.3.

2. The procedures defined in clause 4.7.4.4 shall be used by the Direct Data Collection Client instantiated in the Media Session Handler to report invocations of the *ANBR-based uplink Network Assistance* procedures to the Data Collection AF instantiated in the 5GMSu AF via reference point R2.

#### 4.7.4.3 UE data reporting of AF-based Network Assistance invocations

Invocations of AF-based Network Assistance by the Media Session Handler at reference point M5 for both downlink and uplink media streaming sessions are logged by the 5GMS AF and these logs are passed to the subordinate Data Collection AF according to the requirements of its current event subscribers during active AF-based Network Assistance sessions.

#### 4.7.4.4 UE data reporting of ANBR-based Network Assistance invocations

Invocations of ANBR-based Network Assistance by the Media Session Handler for both downlink and uplink media streaming shall be reported by the Network Assistance subfunction of the Direct Data Collection Client to the Data Collection AF at reference point R2 according to the reporting requirements indicated in a data collection client configuration it has previously obtained at this reference point.

ANBR-based Network Assistance invocation reports shall contain the following parameters:

* Timestamp of the invocation.
* UE identification, e.g. the GPSI or current IP address.
* The DNN and S-NSSAI.
* UE location.
* Recommended bit rate.

Since ANBR-based Network Assistance does not have the concept of a Network Assistance session, the Media Session Handler shall emulate Network Assistance sessions aligned with media streaming sessions, with the last report being made upon termination of the media streaming session. This enables a clear attribution of ANBR-based Network Assistance performance to media streaming sessions.

### 4.7.3 UE data processing for 5GMS

#### 4.7.3.1 UE data processing procedures for downlink media streaming

The following restriction dimensions and aggregation functions defined in clause 4.5.2 of TS 26.531 [22] may be provisioned in a Data Access Profile as part of a 5GMSd Provisioning Session and shall, as a consequence, be applied to reported UE data prior to exposing it to event consumers.

Table 4.7.3.1‑1: Valid processing of downlink media streaming UE data by the Data Collection AF

|  |  |  |
| --- | --- | --- |
|  | Restriction dimension | Aggregation function |
|  | Time | User | Location | None | Count | Mean | Maximum | Minimum | Sum |
| QoE metrics for downlink media streaming | Yes | Yes | Yes | Yes | Yes(NOTE 1) | Yes(NOTE 1) | Yes(NOTE 1) | Yes(NOTE 1) | Yes(NOTE 1) |
| Consumption of downlink media streaming | Yes | Yes | Yes | Yes | Yes(NOTE 2) | No | No | No | No |
| Downlink dynamic policy invocations | Yes | Yes | Yes | Yes | Yes(NOTE 3) | No | No | No | No |
| AF-based downlink Network Assistance invocations | Yes | Yes | Yes | Yes | Yes(NOTE 3) | Yes(NOTE 4) | Yes(NOTE 4) | Yes(NOTE 4) | No |
| ANBR-based downlink Network Assistance invocations | Yes | Yes | Yes | Yes | Yes(NOTE 3) | Yes(NOTE 4) | Yes(NOTE 4) | Yes(NOTE 4) | No |
| Downlink media streaming access activity | Yes | Yes | Yes | Yes | Yes(NOTE 2) | No | No | No | No |
| NOTE 1: Aggregation functions applied individually to all exposed metrics within the scope of the applicable restriction dimension(s).NOTE 2: Number of downlink media streaming sessions within the scope of the applicable restriction dimension(s).NOTE 3: Number of invocations within the scope of the applicable restriction dimension(s).NOTE 4: Aggregation functions applied to bit rate recommendations and throughput estimations within the scope of the applicable restriction dimension(s). |

#### 4.7.3.2 UE data processing procedures for uplink media streaming

The following restriction dimensions and aggregation functions defined in clause 4.5.2 of TS 26.531 [22] may be provisioned in a Data Access Profile as part of a 5GMSu Provisioning Session and shall, as a consequence, be applied to reported UE data prior to exposing it to event consumers.

Table 4.7.3.2‑1: Valid processing of uplink media streaming UE data by the Data Collection AF

|  |  |  |
| --- | --- | --- |
|  | Restriction dimension | Aggregation function |
|  | Time | User | Location | None | Count | Mean | Maximum | Minimum | Sum |
| AF-based uplink Network Assistance invocations | Yes | Yes | Yes | Yes | Yes(NOTE 1) | Yes(NOTE 2) | Yes(NOTE 2) | Yes(NOTE 2) | No |
| ANBR-based uplink Network Assistance invocations | Yes | Yes | Yes | Yes | Yes(NOTE 1) | Yes(NOTE 2) | Yes(NOTE 2) | Yes(NOTE 2) | No |
| NOTE 1: Number of invocations within the scope of the applicable restriction dimension(s).NOTE 2: Aggregation functions applied to bit rate recommendations and throughput estimations within the scope of the applicable restriction dimension(s). |

### 4.7.4 Event exposure of 5GMS UE data

#### 4.7.4.1 Event exposure for downlink media streaming UE data

The following types of events are exposed by the Data Collection AF instantiated in the 5GMSd AF:

1. *QoE metrics for downlink media streaming* reported by the Media Session Handler to the Data Collection AF instantiated in the 5GMSd AF.

2. *Consumption of downlink media streaming* reported by the Media Session Handler to the Data Collection AF instantiated in the 5GMSd AF.

3.- Invocations of *downlink dynamic policies* in the 5GMSd AF by the Media Session Handler.

4. Invocations of *AF-based downlink Network Assistance* in the 5GMSd AF by the Media Session Handler, as defined in clause 4.7.4.6.

5. *Downlink media streaming access activity* reported by the 5GMSd AS to the Data Collection AF instantiated in the 5GMSd AF.

6. Invocations of *ANBR-based downlink Network Assistance* reported by the Direct Data Collection Client instantiated in the Media Session Handler to the Data Collection AF instantiated in the 5GMSd AF, as defined in clause 4.7.4.6.

High-level procedures for downlink media streaming event exposure are defined in clause 5.11.3.

#### 4.7.4.2 Event exposure for uplink media streaming UE data

The following types of events are exposed by the Data Collection AF instantiated in the 5GMSd AF:

1. Invocations of *AF-based uplink Network Assistance* in the 5GMSd AF by the Media Session Handler, as defined in clause 4.7.4.6.

2. Invocations of *ANBR-based uplink Network Assistance* reported by the Direct Data Collection Client instantiated in the Media Session Handler to the Data Collection AF instantiated in the 5GMSu AF, as defined in clause 4.7.4.6.

High-level procedures for uplink media streaming event exposure are defined in clause 6.8.3.

#### 4.7.4.3 Event exposure of QoE metrics UE data

The baseline parameters for exposure of QoE metrics events by the Data Collection AF are for further study.

#### 4.7.4.4 Event exposure of consumption reporting UE data

The baseline parameters for exposure of consumption reporting events by the Data Collection AF are for further study.

#### 4.7.4.5 Event exposure of dynamic policy invocation UE data

The baseline parameters for exposure of dynamic policy invocation events by the Data Collection AF are for further study.

#### 4.7.4.6 Event exposure of Network Assistance UE data

For both AF-based Network Assistance and ANBR-based Network Assistance, the Data Collection AF shall include the following parameters in each event it exposes to event consumers:

Table 5.9.5‑1: Baseline parameters for Network Assistance invocations collection

|  |  |  |
| --- | --- | --- |
| Parameter | Cardinality | Description |
| Collection timestamp | 1..1 | The date–time at which the collection was exposed by the Data Collection AF as an event to its subscribed event consumers. |
| Start timestamp | 1..1 | Date–time of earliest Network Assistance invocation included in or summarised by this collection. |
| End timestamp | 1..1 | Date–time of latest Network Assistance invocation included in or summarised by this collection. |
| Request count | 1..1 | The number of Network Assistance invocations included in or summarised by this collection.Where summary records are included in the collection the number of records in the collection differs from this number. |
| Media streaming direction | 1..1 | Indicating whether this collection of Network Assistance invocations relates to downlink media streaming sessions or to uplink media streaming sessions. |
| Record summarisation descriptor | 1..\* | Nature of the records included in this collection. One or more of the following:*- None:* Event includes a separate record for each Network Assistance invocation.*- Count:* Event describes only the number of Network Assistance invocations over a certain time period with no individual records provided.*- Mean:* Event includes a record summarising the mean average value of each QoS parameter over a certain time period.*- Minimum:* Event includes a record summarising the smallest value of each QoS parameter over a certain time period.*- Maximum:* Event includes a record summarising the largest value of each QoS parameter over a certain time period. |
| Records | 0..\* | A set of records, each one describing a Network Assistance invocation or summarising a set of Network Assistance invocations. |

And for each record in the collection:

Table 5.9.5‑2: Baseline parameters for Network Assistance invocation record

|  |  |  |
| --- | --- | --- |
| Parameter | Cardinality | Description |
| Record type | 1..1 | Indicating the nature of information carried in this Network Assistance invocation record:- Individual invocation record.- Mean parameter values summary record.- Minimum parameter values summary record.- Maximum parameter values summary record. |
| UE identification | 0..1 | GPSI and/or IP address of the UE seeking Network Assistance.Present only for individual invocation record types. |
| Data Network Name | 0..1 | Identifying the Data Network for which Network Assistance was sought.Present only for individual invocation record types. |
| Slice identification | 0..1 | The S-NSSAI identifying the Network Slice on which Network Assistance was sought.Present only for individual invocation record types. |
| UE location | 0..1 | The location of the UE when Network Assistance was sought.Present only for individual invocation record types. |
| Record subtype | 1..1 | Indicating which of the following Network Assistance features was invoked by the UE:- Bit rate recommendation solicited from AF by 5GMS Client.- Bit rate boost requested from AF by 5GMS Client.- Background data transfer requested from AF by 5GMS Client.- … |
| QoS parameters requested | 0..1 | The network QoS parameters (if any) requested from the 5GMS AF or RAN by the 5GMS Client. |
|  |  |  |  |
| QoS parameters granted | 0..1 | The network QoS parameters (if any) granted by the 5GMS AF or RAN to the 5GMS Client. |
|  |  |  |  |

#### 4.7.4.5 Event exposure of media streaming access activity UE data

The baseline parameters for exposure of media streaming access activity events by the Data Collection AF are for further study.

# D.6 Invocation of Network Assistance

The AF-based Network Assistance feature enables a UE to receive a bit rate recommendation from a 5GMS AF providing the Network Assistance server function.

The 5GMS AF uses the Npcf\_PolicyAuthorization notification or Nnef\_MonitoringEvent procedure to receive notifications of network QoS changes, e.g. estimation of throughput, recommendation of a bit rate. The 5GMS AF receives these policy change notifications asynchronously.

The 5GMS AF reports the invocation of AF-based network assistance to its subordinate Data Collection AF, including information about requested QoS and recommended QoS. The Data Collection AF subsequently exposes this UE data to the Event Consumer AF within the 5GMS Application Provider. Using this information, the 5GMS Application Provider is able to optimise the use of the 5GMS System, e.g. by performing dynamic congestion window adjustment.

Data collection and reporting may also be used in case the UE implements ANBR-based Network Assistance. In this case the Direct Data Reporting Client reports the invocations of ANBR-based Network Assistance directly to the 5GMS AF’s subordinate Data Collection AF.

The NWDAF subscribes to events of this type at the Data Collection AF, specifying the relevant application filter and any relevant location and/or user filters. Based on the requested QoS and recommended QoS in the exposed events, the NWDAF analyses whether the current network deployment or status can support the currently provisioned media streaming services, and exposes these results to the OAM for better network optimization.