**3GPP TSG-WG SA4 Meeting #132 *S4-250894***

**Fukuoka, May 19 – 23, 2025 (revision of S4-250XXX)**

**Source: Huawei, HiSilicon**

**Title: Stage 3 on Improved QoS Support for Media Streaming services**

**Document for: Approval**

**Agenda Item: 8.5**

**Work Item / Release: AMD\_PRO-MED / Rel-19**

# Introduction

In last SA4#131-bis-e meeting, the stage 3 CR on Improved QoS support for Media Streaming services is endorsed in S4-250660. However, some aspects are still missing.

# Proposal

It is proposed to agree and merge the following into TS 26.510 CR0020.

\* \* \* \* First change \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

• References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

• For a specific reference, subsequent revisions do not apply.

• For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System architecture for the 5G System (5GS)".

[3] 3GPP TS 23.502: "Procedures for the 5G System (5GS); Stage 2".

[4] 3GPP TS 26.501: "5G Media Streaming (5GMS); General description and architecture".

[5] 3GPP TS 26.506: "5G Real-time Media Communication Architecture (Stage 2)".

[6] 3GPP TS 26.512: "5G Media Streaming (5GMS); Protocols".

[7] 3GPP TS 26.113: "Real-Time Media Communication; Protocols and APIs".

[8] 3GPP TS 26.247: "Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH)".

[9] 3GPP TS 26.118: "Virtual Reality (VR) profiles for streaming applications".

[10] ITU-T Recommendation X.509 (2005) | ISO/IEC 9594-8:2005: "Information Technology – Open Systems Interconnection – The Directory: Public-key and attribute certificate frameworks".

[11] IETF RFC 5280: "Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile", May 2008.

[12] IETF RFC 7468: "Textual Encodings of PKIX, PKCS, and CMS Structures", April 2015.

[13] 3GPP TS 23.558: "Architecture for enabling edge applications".

[14] 3GPP TS 24.558: "Enabling Edge Applications; Protocol specification".

[15] 3GPP TS 29.558: "Enabling Edge Applications; Application Programming Interface (API) specification; Stage 3".

[16] 3GPP TS 23.003: "Numbering, addressing and identification".

[17] 3GPP TS 23.503: "Policy and charging control framework for the 5G System (5GS); Stage 2".

[18] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[19] 3GPP TS 29.522: "5G System. Network Exposure Function Northbound APIs; Stage 3".

[20] 3GPP TS 29.122: "T8 reference point for Northbound APIs".

[21] 3GPP TS 27.007: "AT Command set for User Equipment (UE)".

[22] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[23] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification".

[24] IETF RFC 9110: "HTTP Semantics", June 2022.

[25] IETF RFC 9111: "HTTP Caching", June 2022.

[26] IETF RFC 9112: "HTTP/1.1", June 2022.

[27] IETF RFC 9113: "HTTP/2", June 2022.

[28] 3GPP TS 26.531: "Data Collection and Reporting; General Description and Architecture".

[29] IETF RFC 8446: "The Transport Layer Security (TLS) Protocol Version 1.3", August 2018.

[30] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[31] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[32] OpenAPI: "OpenAPI 3.0.0 Specification", <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md>.

[33] 3GPP TS 29.571: "Common Data Types for Service Based Interfaces; Stage 3".

[34] IETF RFC 3339: "Date and Time on the Internet: Timestamps", July 2002.

[35] IETF RFC 3986: "URI Generic Syntax", June 2005.

[36] Standard ECMA-262, 5.1 Edition: "ECMAScript Language Specification", June 2011.

[37] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format", December 2017.

[38] IETF draft-bhutton-json-schema-validation: "JSON Schema Validation: A Vocabulary for Structural Validation of JSON", June 2022.

[39] 3GPP TS 29.517: "5G System; Application Function Event Exposure Service; Stage 3".

[40] 3GPP TS 26.532: "Data Collection and Reporting; Protocols and Formats".

[41] ISO 3166‑1: "Codes for the representation of names of countries and their subdivisions — Part 1: Country codes".

[42] ISO 3166‑2: "Codes for the representation of names of countries and their subdivisions — Part 2: Country subdivision code".

[43] IETF RFC 2474: "Definition of the Differentiated Services Field (DS Field) in the IPv4 and IPv6 Headers", December 1998.

[44] IETF RFC 3246: "An Expedited Forwarding PHB (Per-Hop Behavior)", March 2022.

[45] IETF RFC 2597: "Assured Forwarding PHB Group", June 1999.

[46] 3GPP TS 29.554: "5G System; Background Data Transfer Policy Control Service; Stage 3".

[47] IETF RFC 6749: "The OAuth 2.0 Authorization Framework", October 2012.

[48] 3GPP TS 29.222: "Common API Framework for 3GPP Northbound APIs; Stage 3".

[49] IETF RFC 7230: "Hypertext Transfer Protocol (HTTP/1.1): Message Syntax and Routing", June 2014.

[50] OASIS: "MQTT Version 5.0", <https://docs.oasis-open.org/mqtt/mqtt/v5.0/mqtt-v5.0.html>.

[51] IETC RFC 7519: "JSON Web Token (JWT)", May 2015.

[Z] 3GPP TS 29.564: "5G System; User Plane Function Services; Stage 3".

[ECN] IETF RFC XXXX: "".

\* \* \* \* Next change \* \* \* \*

#### 5.2.7.1 General

These operations are used by the Media Application Provider to configure Policy Templates for the media delivery sessions of a particular Provisioning Session.

A Policy Template, identified by its policyTemplateId, represents a set of PCF/NEF API parameters which defines the service quality and/or associated charging for the corresponding media delivery session(s). The Policy Template is configured as part of the provisioning procedures with the Media AF using the API specified in clause 8.7 and is subsequently instantiated by a Media Session Handler or Media AS (whichever is acting as Dynamic Policy invoker) using the interactions specified in clause 5.3.3.

When a Policy Template requires media to be delivered in a specific Data Network and/or network slice at reference point M4, the applicationSessionContext array shall be present with at least one of the following properties populated:

- The dnn property contains the name of the Data Network in which the Media AS is hosted.

- When Network Slicing is used, the sliceInfo property contains information about the network slice which is serving the UE.

When a Policy Template is intended to influence the network QoS of Service Data Flows used for media delivery, the qoSSpecifications array shall be populated with objects of type QosRange (see clause 7.3.3.4). Each member of the array describes the QoS limits of an application service component that a Media Client is permitted request when instantiating the Policy Template:

- The componentReference property is a string used by the Dynamic Policy invoker to reference this QosRange when instantiating the Policy Template. It shall be unique for all members of the same qoSSpecifications array.

- The qosReference value, as specified in clause 5.6.2.7 of TS 29.514 [18], is obtained with the Service Level Agreement. See TS 23.502 [3] for detailed usage.

- The maximumBitRate properties of the downlinkQosSpecification and uplinkQosSpecification objects define the maximal bit rates which are permitted to be requested by a Dynamic Policy invoker on (respectively) downlink and uplink Service Data Flows. These values are defined by configuration of the 5G System and are therefore populated by the Media AF rather than by the Media Application Provider.

- The maximumAuthorisedBitRate properties of the downlinkQosSpecification and uplinkQosSpecification objects define the maximal bit rates which a Dynamic Policy invoker is authorised to request on (respectively) downlink and uplink Service Data Flows. Higher bit rates are not authorised by the Media Application Provider when the Policy Template is instantiated.

- The minimumPacketLossRate properties of the downlinkQosSpecification and uplinkQosSpecification objects define the minimal packet loss rates which are permitted to be requested by a Dynamic Policy invoker on (respectively) downlink and uplink Service Data Flows. Lower packet loss rates are not permitted by the Media Application Provider when the Policy Template is instantiated.

- The pduSetQosLimits properties of the downlinkQosSpecification and uplinkQosSpecification objects define the minimal delay budget and minimal error rates for PDU Sets which are permitted to be requested by a Dynamic Policy invoker on (respectively) downlink and uplink Service Data Flows. Lower delay and error rates are not permitted by the Media Application Provider when the Policy Template is instantiated.

- The pduSetMarking flag is used to specify whether Media Clients instantiating this Policy Template for uplink media delivery, or Media AS instances for downlink media delivery, are required to apply PDU Set marking to media transport protocol PDUs falling within the scope of a Dynamic Policy Instance based on this Policy Template.

NOTE 1: PDU Set marking is used by the 5G System to satisfy the QoS requirements of application flows.

When a Policy Template is intended to be used for differential charging, the chargingSpecification property shall be present.

When a Policy Template is intended to be used for Background Data Transfer, the properties of a new Background Data Transfer policy are specified by the Media Application Provider in the bdtSpecification property (of type Bdt‌Policy‌Schedule).

- The startDate and endDate indicate the time period for which the Background Data Transfer specification is valid. A Background Data Transfer specification may be removed from its parent Policy Template by the Media AF when it expires.

- The windows property indicates the time windows over which the Background Data Transfer may occur.

- Each such time window is characterised by a start time (startTime), a duration (duration) and the days of the week on which the time window is scheduled (daysOfWeek).

- The numberOfUes property indicates the maximum number of UEs permitted to instantiate the Policy Template and make use of Background Data Transfers during a single time window instance.

- The estimatedDataVolumePerUe that reflects the average data volume that each UE is expected to transfer during a single time window instance.

NOTE 2: The product of the numberOfUes and estimatedDataVolumePerUe properties represents an estimate of the maximum data volume that may be transferred during any given time window instance.

- The aggregate‌Uplink‌BitRate‌Limit and aggregate‌DownlinkBitRate‌Limit properties specify limits on the total aggregate bit rate of all currently instantiated Policy Templates to be enforced by the Media AF's admission control function. If omitted, the Media AF may instantiate a Policy Template with a Background Data Transfer specification regardless of additional costs that may be incurred by the Media Application Provider as a result.

When a Policy Template requires ECN marking for L4S functionality to be enabled, the l4SEnablement property shall be present and set to true.

NOTE 3: The Media AS is assumed to support the L4S protocol stack according to RFC XXXX [ECN].

When a Policy Template requires QoS monitoring, the qoSMonitoringConfiguration property shall be populated with a QosMonitoringInformation object as specified in clause 5.14.2.1.6 of TS 29.122 [20].

HTTP responses for successful and operation-specific failure cases are specified in the following clauses. For all other failure cases, an HTTP response indicating a response code in accordance with clause 7.1.6 shall be returned to the API client. In all failure cases a message body in accordance with clause 7.1.7 shall be included in the response message.

\* \* \* \* Next change \* \* \* \*

#### 5.3.2.1 General

Service Access Information is the set of parameters and addresses needed by the Media Client to activate reception of a downlink media delivery session, to activate an uplink media delivery session for content contribution or to obtain configuration parameters to initiate real-time media communication (RTC).

The Media Session Handler may obtain Service Access Information in one of two ways:

1. From the Media-aware Application via reference point M6. In this case, the Service Access Information is initially acquired by the Media-aware Application from the Media Application Provider via reference point M8 and the Media-aware Application shall pass the parameters to the Media Session Handler using one of the session launch mechanisms specified in clauses 11.2.2.1 and 6.

2. From the Media AF via reference point M5. In this case, the Service Access Information is derived by the Media AF from a Provisioning Session established at reference point M1 and the Media AF exposes this to the Media Session Handler using the operations specified in this clause. At the start of a media delivery session, a minimal set of baseline Service Access Information parameters is passed to the Media Session Handling using one of the session launch mechanisms specified in clauses 11.2.2.1 and 6 and this causes it to fetch the full Service Access Information from the Media AF using the procedure specified in clause 5.3.2.3.

The data model of the Service Access Information resource acquired by the Media Session Handler of the Media Client is specified in clause 9.2.3. The Service Access Information typically includes:

- For downlink media streaming according to TS 26.512 [6], a set of Media Entry Points that can be consumed by the Media Access Function. One of these is selected by the Media Session Handler or by the Media-aware Application and is handed to the Media Access Function via reference point M11 or M7 respectively.

- For uplink media according to TS 26.512 [6], a description of an entry point for the publishing of the uplink streaming content.

- For RTC according to TS 26.113 [7] specifies a configuration for the Media Client to assist in establishing interactive connectivity with other RTC session participants.

Service Access Information additionally includes configuration information to allow the Media Session Handler to invoke procedures for dynamic policy (see clause 5.3.3), network assistance (clause 5.3.4), QoE metrics reporting (clause 5.3.5) and consumption reporting (clause 5.3.6).

To support dynamic policy instantiation, Service Access Information shall include a Policy Template Binding for each Policy Template provisioned in the applicable Provisioning Session (see clause 5.2.7.1) populated as follows:

- The externalReference property shall be populated from the externalReference property of the corresponding Policy Template.

- The policyTemplateId property shall be populated from the policyTemplateId property of the corresponding Policy Template.

- The pduSetMarking property shall be present and set true if any member of the qoSSpecifictions array of the corresponding Policy Template has a pduSetMarking property set true.

- The bdtWindows property shall be populated with a forward schedule of Background Data Transfer windows based on the bdtSpecification property of the corresponding Policy Template (if provisioned) and/or based on interactions between the Media AF and the PCF/NEF as specified in clause 5.5.3.

- If the l4SEnablement property is present and set to true in a Policy Template to indicate that ECN marking for L4S functionality is required, the corresponding Policy Template Binding shall include the l4SEnablement flag set to the same value.

- If the qoSMonitoringConfiguration property is present in a Policy Template to indicate that QoS monitoring functionality is required, the corresponding Policy Template Binding shall include the qoSMonitoring‌Required flag set to true.

If an Edge Resources Configuration with client-driven management (EM\_CLIENT\_DRIVEN) is provisioned in the applicable Provisioning Session (see clause 5.2.6), the Media AF shall convey a Client Edge Resources Configuration to the Media Session Handler as part of the Service Access Information it provides at reference point M5.

HTTP responses for successful and operation-specific failure cases are specified in the following clauses. For all other failure cases, an HTTP response indicating a response code in accordance with clause 7.1.6 shall be returned to the API client. In all failure cases a message body in accordance with clause 7.1.7 shall be included in the response message.

\* \* \* \* Next change \* \* \* \*

### 5.4.3 Dynamic Policy invocation

At the start of a media delivery session, the Media Session Handler shall determine the external reference and target QoS parameters of the initial Service Operation Point by invoking an appropriate API method on the Media Session Handler at reference point M11. Based on the parameter values supplied, the Media Session Handler shall attempt to instantiate a Dynamic Policy satisfying the Media Access Function’s requirements using the operation specified in clause 5.3.3.2 if the target QoS lies within the bounds of a Policy Template with the corresponding external reference advertised in the Service Access Information for the media delivery session.

The Media Session Handler shall subscribe to receive notifications from the Media Access Function at reference point M11 of changes to the Service Operation Point during the course of the media delivery session. When such a change occurs (e.g., when the Media Access Function selects a different MPEG‑DASH Representation), the Media Access Function shall send a notification to the Media Session Handler at reference point M11 citing the external reference and target QoS parameters of the new Service Operation Point. If the QoS of the new Service Operation Point is not satisfied by the currently instantiated Dynamic Policy, the Media Session Handler shall attempt to instantiate a Dynamic Policy satisfying the Media Access Function’s requirements using the operation specified in clause 5.3.3.2 if the target QoS lies within the bounds of a Policy Template with the corresponding external reference advertised in the Service Access Information for the media delivery session.

The Media-aware Application shall subscribe to receive notifications from the Media Session Handler at reference point M6 concerning Background Data Transfer opportunities. When such an opportunity is announced to the Media Session Handler by the Media AF at reference point M5, the Media Session Handler shall send a corresponding notification to the Media-aware Application at reference point M6 that includes an estimate of the opportunity window. If it wishes to avail itself of the Background Data Transfer opportunity, the Media-aware Application shall invoke a suitable API method on the Media Session Handler at reference point M6, providing an estimate of the data volume it intends to transfer over reference point M4. The Media Session Handler shall then attempt to instantiate a Dynamic Policy with Background Data Transfer network characteristics (including the data volume estimate supplied by the Media-aware Application) using the operation specified in clause 5.3.3.2 if a suitable Policy Template is advertised in the Service Access Information for the media delivery session.

The Media Access Function shall subscribe to receive notifications from the Media Session Handler at reference point M11 concerning instantiation of Policy Templates that require ECN marking for L4S functionality according to RFC XXXX [ECN] to be enabled. When successful instantiation of such a Policy Template is confirmed to the Media Session Handler by the Media AF at reference point M5, the Media Session Handler shall send a corresponding notification to the Media Access Function at reference point M11 to inform it that ECN marking for L4S functionality is required to be enabled for the corresponding media delivery session. The Media Access Function shall then enable ECN marking for L4S functionality as specified in clause X..

The Media Access Function shall subscribe to receive notifications from the Media Session Handler at reference point M11 concerning successful instantiation of Policy Templates that require QoS monitoring to be enabled. When successful instantiation of such a Policy Template is confirmed to the Media Session Handler by the Media AF at reference point M5, the Media Session Handler shall send a corresponding notification to the Media Access Function at reference point M11 to inform it that QoS monitoring is enabled for the corresponding media delivery session. On receipt of such a confirmation, the Media Access Function shall further subscribe to receive notifications from the Media Session Handler at reference point M11 concerning the QoS monitoring results. When QoS monitoring results are notified to the Media Session Hander by the Media AF at reference point M5 (via the asynchronous MQTT notification channel for the Dynamic Policy instance – see clause 5.3.3.2), the Media Session Hander shall send a notification to the Media Access Function at reference point M11. The Media Access Function may use the QoS monitoring results accordingly, e.g. to request/upload the next media segment based on the reported packet latency, change the bit rate of next requested/uploaded media segment based on the reported congestion status.

\* \* \* \* Next change \* \* \* \*

### 5.5.3 Policy control interactions for Dynamic Policies

The Dynamic Policies feature operates at reference point M5 between the Media Session Handler in the Media Client and a Media AF that has been appropriately provisioned with Policy Templates (see clause 5.2.7). The Dynamic Policy API at reference point M5 (see clauses 5.3.3 and 9.3) is specified in a generic way such that the associated functionality in the 5GC may be realised by various means.

NOTE 1: This clause does not limit the possible set of 5G System exposure functionalities for realising dynamic policies.

In this release, the Media AF converts Dynamic Policies API invocations received at reference point M5 into direct or indirect invocations of the Policy Authorization Service exposed by the PCF, and converts responses from the PCF into their equivalents at reference point M5 for return to the Media Session Handler.

To realise dynamic policies, the Media AF shall interact with the PCF using one of the following methods:

A. If the Media AF is deployed in the Trusted DN, it may directly invoke the Npcf\_Policy‌Authorization service at reference point N5, as specified in TS 29.514 [18].

NOTE 2: It is the responsibility of the Media AF in this case to discover and track changes to the PCF instance responsible for the PDU Session supporting the media streaming session at reference point M4 using the discovery services provided by the NRF and/or BSF.

B. If the Media AF is deployed outside the Trusted DN, or if it is more convenient for a Media AF deployed in the Trusted DN to do so, it invokes the Nnef\_AFSession‌With‌QoS and/or Nnef\_Chargeable‌Party services exposed by the NEF, as specified in clauses 4.4.9 and 4.4.8 respectively of TS 29.522 [19], to indirectly invoke the PCF at reference point N33.

NOTE 3: Per clause 4.4.9 of TS 29.522 [19], the Nnef\_AFSession‌With‌QoS service is realised at reference point N33 by the AsSession‌With‌QoS exposure API. Similarly, the Nnef\_Chargeable‌Party service is realised by the Chargeable‌Party exposure API per clause 4.4.8 of [19].

NOTE 4: Configuration of the NEF endpoint address and access credentials in the Media AF in this case is beyond the scope of the present document.

When the first Dynamic Policy is created by the Media Session Handler for a particular media delivery session (per clause 5.3.3.2), the Media AF shall create an *AF application session context* in the PCF responsible for the PDU Session corresponding to the M4 application flows indicated in the DynamicPolicy.‌application‌Flow‌Bindings array.

If no corresponding AF application session context already exists, the Media AF shall use the Npcf\_‌Policy‌Authorization\_‌Create operation at reference point N5 (or, if deployed outside the Trusted DN, the equivalent Nnef\_AFsession‌WithQoS service operation) with the appropriate service information to create and provision a new AF application session context. The information in the AppSessionContext‌ReqData shall be derived from the application flow descriptions in the Dynamic Policy Instance resource and/or the requested QoS.

The mapping of application flows listed in the DynamicPolicy.‌application‌Flow‌Bindings array to media components and sub-components of the AF application session context is implementation-dependent.

[If the pduSetQoSLimits property is populated in QosRange.‌downlink‌QoS‌Specification, then the Media‌Component.‌pduSetQosDl object shall be populated as follows by the Media AF:

- The pduSetDelayBudget property shall be set to the larger value of pduSetQoSLimits.‌pduSetDelayBudget and desiredDownlink‌PduSet‌QosParameters.‌pduSetDelayBudget.

- The pduSetErrorRate property shall be set to the larger value of pduSetQoSLimits.pduSetErrorRate and desiredDownlink‌PduSet‌QosParameters.‌pduSetErrorRate.

- The pduSetHandlingInfo property shall be set to the value of pduSetQoSLimits.pduSetHandlingInfo, ignoring the value of desiredDownlink‌PduSet‌QosParameters.‌pduSetHandlingInfo, if any.

Otherwise, the Media‌Component.‌pduSetQosDl object shall be populated directly from the desiredDownlink‌PduSet‌QosParameters object.

If the pduSetQoSLimits property is populated in QosRange.‌uplink‌QoS‌Specification, then the Media‌Component.‌pduSetQosUl object shall be populated as follows by the Media AF:

- The pduSetDelayBudget property shall be set to the larger value of pduSetQoSLimits.‌pduSetDelayBudget and desiredUplink‌PduSet‌QosParameters.‌pduSetDelayBudget.

- The pduSetErrorRate property shall be set to the larger value of pduSetQoSLimits.‌pduSetErrorRate and desiredUplink‌PduSet‌QosParameters.‌pduSetErrorRate.

- The pduSetHandlingInfo property shall be set to the value of pduSetQoSLimits.‌pduSetHandlingInfo, ignoring the value of desiredUplink‌PduSet‌QosParameters.‌pduSetHandlingInfo, if any.

Otherwise, the Media‌Component.‌pduSetQosUl object shall be populated directly from the desiredUplink‌PduSet‌QosParameters object.]

When instantiating a Policy Template that includes the l4SEnablement property set to true, the Media AF shall enable ECN marking for L4S functionality in the 5G System by invoking the Npcf\_‌PolicyAuthorization\_‌Create service operation at reference point N5 (see clause 4.2.2 of TS 29.514 [18]) or the Nnef\_‌AFsessionWithQoS\_‌Create service operation at reference point N33 (see clause 5.14 of TS 29.122 [20]) for the media application flow(s) described by the Dynamic Policy Instance.

When instantiating a Policy Template that includes aqoSMonitoringConfiguration property, the Media AF shall enable QoS monitoring in the 5G System by invoking the Npcf\_‌PolicyAuthorization\_‌Create service operation on the PCF at reference point N5 (see clause 4.2.2 of TS 29.514 [18]) or the Nnef\_‌AFsessionWithQoS\_‌Create service operation on the NEF at reference point N33 (see clause 5.14 of TS 29.122 [20]), including the QoSMonitorConfig object from the Policy Template as a parameter.

For each of the Dynamic Policy Instances it is managing, the Media AF shall subscribe to the following PCF/NEF notifications on the corresponding AF application session context:

- Service Data Flow QoS notification control;

- Service Data Flow deactivation;

- Resources allocation outcome;

- Service Data Flow L4S enablement;

- Service Data Flow QoS monitoring enablement;

- Service Data Flow QoS monitoring results.

For each of the Dynamic Policy Instances it is managing with QoS monitoring successfully enabled in the 5G System, the Media AF may subscribe to the following notifications from a local UPF managing the corresponding application data flow(s) using the Nupf\_EventExposure service specified in clause 6.1 of TS 29.564 [Z]:

- Service Data Flow QoS monitoring results.

NOTE: In this context, "local UPF" refers to a UPF instance inserted for local access in case the Media AS is deployed as an EAS instance in the Edge DN. In order to reduce the latency of exposing QoS monitoring results, the local UPF provides network status notifications directly to the 5GMd AF (or via a locally deployed NEF) as defined in clause 5.8.2.17 of TS 23.501 [2].

When requesting QoS provisioning for a media delivery session, the Media AF shall use the configured Policy Template of the Dynamic Policy Instance to determine the list of the QoS references within altSerReqs. The lowest priority index shall be assigned to the Policy Template with the lowest QoS requirement, and the highest priority shall be assigned to the Service Operation Point requested by the UE (if the UE is allowed to use that operation point).

When instantiating a Policy Template that has a Background Data Transfer policy, the Media AF needs to populate some of the properties in the ClientBdtSpecification object specified in clause 9.3.3.3 for inclusion in the Dynamic Policy Instance resource returned to the Media Session Handler at reference point M5.

When the Policy Template references an existing Background Data Transfer policy by including the bdtPolicyId property, in order to populate the properties of the ClientBdtSpecification object the Media AF shall first retrieve the individual Background Data Transfer policy resource referenced by bdtPolicyId from the PCF. The Npcf\_‌BDT‌Policy‌Control service operation specified in clause 5.3.3.3.1 of TS 29.554 [46] shall be used for this purpose.

When instantiating a Policy Template that includes the l4SEnablement property set to true, the enablement status of ECN marking for L4S functionality in the 5G System shall be populated in the Dynamic Policy instance resource returned to the Media Session Handler by the Media AF, as specified in clause 5.3.3.2.

When instantiating a Policy Template that includes aqoSMonitoringConfiguration property, the enablement status of QoS monitoring in the 5G System shall be populated in the Dynamic Policy instance resource returned to the Media Session Handler by the Media AF, as specified in clause 5.3.3.2. QoS monitoring results subsequently provided by the PCF/NEF or by the local UPF/NEF shall be further notified to Media Session Handler by the Media AF via the asynchronous MQTT notification channel for the Dynamic Policy instance as also specified in clause 5.3.3.2.

When a dynamic policy is subsequently destroyed by the Media Session Handler (per clause 4.7.3), the Media AF shall destroy the corresponding AF application session context in the relevant PCF instance.

\* \* \* \* Next change \* \* \* \*

### 10.2.3 Notification message format

The Media AF shall format each notification it publishes to the notification channel as an MQTT Application Message conveyed as the payload of an MQTT PUBLISH message.

- The *Topic* property of the Variable Header shall be as specified in clause 10.2.2.

- The *Payload Format Indicator* property of the Variable Header shall indicate UTF-8 encoding of the *Payload* field.

The notification message shall be conveyed in the *Payload* field which shall be a formatted as a NotificationMessage JSON [37] object as specified in table 10.2.3-1 using the UTF‑8 character encoding. The corresponding OpenAPI [32] definition of this data type is specified in clause A.5.1.

Table 10.2.3‑1: NotificationMessage data type

|  |  |  |  |
| --- | --- | --- | --- |
| Property name | Type | Cardinality | Description |
| type | NotificationMessageType | 1..1 | The type of resource carried by this notification message (see table 10.2.3‑2). |
| reason | NotificationReason | 1..1 | The reason for the notification (see table 10.2.3‑3). |
| entityTag | string | 0..1 | Strong entity tag for the resource carried by this notification message.The value shall be the same as that of the ETag HTTP response header signalled by the Media AF at reference point M5 per clause 7.1.4.2. |
| lastModified | DateTime | 0..1 | The date-time at which the resource carried by this notification message was last modified by the Media AF.The value shall be the same as that of the Last-Modified HTTP response header signalled by the Media AF at reference point M5 per clause 7.1.4.2. |
| serviceAccessInformation | ServiceAccessInformation | 0..1 | Present if *type* is NOTIFICATION\_‌SERVICE\_ACCESS\_INFORMATION. |
| dynamicPolicy | DynamicPolicy | 0..1 | Present if *type* is NOTIFICATION\_‌DYNAMIC\_POLICY\_INSTANCE. |
| networkAssistanceSession | NetworkAssistanceSession | 0..1 | Present if *type* is NOTIFICATION\_‌NETWORK\_‌ASSISTANCE\_‌SESSION. |

Exactly one of the following properties shall be present: service‌Access‌Information, dynamic‌Policy, network‌Assistance‌Session.

The type of the notification message shall be indicated using one of the values in table 10.2.3‑2.

Table 10.2.3‑2: NotificationMessageType enumeration

|  |  |
| --- | --- |
| Enumeration value | Description |
| NOTIFICATION\_‌SERVICE\_‌ACCESS\_‌INFORMATION | Notification of a change to a Service Access Information resource. |
| NOTIFICATION\_‌DYNAMIC\_‌POLICY\_‌INSTANCE | Notification of a change to a Dynamic Policy Instance resource. |
| NOTIFICATION\_‌NETWORK\_‌ASSISTANCE\_‌SESSION | Notification of a change to a Network Assistance Session resource. |

The reason for sending the notification message shall be indicated using one of the values in table 10.2.3‑3.

Table 10.2.3‑3: NotificationReason enumeration

|  |  |
| --- | --- |
| Enumeration value | Description |
| NOTIFICATION\_‌REASON\_‌PROVISIONING\_‌UPDATE | The notification is being sent as a result of an update to a Provisioning Session in the Media AF or to one of its subresources (see clause 8). |
| NOTIFICATION\_‌REASON\_‌BACKGROUND\_‌DATA\_‌TRANSFER\_‌WINDOW\_‌CANCELLATION | The notification is being sent because a Background Data Transfer window has been cancelled by the Media AF. |
| NOTIFICATION\_‌REASON\_‌QOS\_‌MONITORING\_‌RESULTS | The notification is being sent because the Media AF has received QoS monitoring results from the 5G Core. |

\* \* \* \* Next change \* \* \* \*

#### 9.2.3.1 ServiceAccessInformation resource type

The data model for the ServiceAccessInformation resource is specified in table 9.2.3.1-1 below. Different properties are present in the resource depending on the type of Provisioning Session from which the Service Access Information is derived (as indicated in the provisioningSessionType property) and this is specified in the *Applicability* column.

Table 9.2.3.1‑1: Definition of ServiceAccessInformation resource

| Property name | Type | Cardinality | Description | Applicability |
| --- | --- | --- | --- | --- |
| provisioningSessionId | ResourceId | 1..1 | Unique identification of the M1 Provisioning Session. | All types |
| provisioningSession‌Type | Provisioning‌Session‌Type | 1..1 | The type of Provisioning Session. | All types. |
| locationReporting | boolean | 1..1 | If true, the Media Session Handler or Media AS is required to provide UE location data in Dynamic Policy interactions (see clause 9.3.3.1), Network Assistance interactions (see clause 9.4.3.1), QoE metrics reporting interactions (see clause 9.5.3) and consumption reporting interactions (see clause 9.6.3.2).Shall be set *false* if the locationReporting parameter is omitted from the ProvisioningSession, as specified in table 8.2.3.1‑1. | All types. |
| notificationURL | AbsoluteURL | 0..1 | A URL to the MQTT channel, nominated by the Media AF, over which notifications are to be sent by the Media AF (see clause 10.2). | All types. |
| streamingAccess | object | 0..1 | Present if Content Hosting or Content Publishing is provisioned in the parent Provisioning Session. | MS\_DOWNLINK*,*MS\_UPLINK |
|  | entryPoints | array(Absolute‌Media‌Entry‌Point) | 0..1 | A list of alternative Media Entry Points for the Media Client to choose between. |
|  |  | locator | AbsoluteUrl | 1..1 | Populated from information in the Content Hosting Configuration or Content Publishing Configuration as specified in clause 8 of TS 26.512 [6].- For downlink media streaming, either a pointer to a document at reference point M4 that defines a media presentation (e.g. a DASH MPD) whose resources are mapped to a content ingest configuration at reference point M2, or else the URL of a single media resource (e.g. an MP4 asset) available for download at reference point M4 that is mapped to reference point M2 by a Content Hosting Configuration. In both cases, the contentType property shall also be present.- For uplink media streaming, either a pointer to a document at reference point M4 that defines a media presentation (e.g. a DASH MPD) whose resources are mapped to an egest configuration at reference point M2 (in which case the contentType property shall also be present), or else the URL of a path at reference point M4 the sub-resources of which are mapped to reference point M2 by a Content Publishing Configuration (in which case the protocol property shall also be present). |
|  |  | contentType | string | 1..1 | The MIME content type of resource at locator.This property shall be mutually exclusive with protocol. |  |
|  |  | protocol | Uri | 1..1 | A fully-qualified term identifier URI that identifies the media delivery protocol at reference point M4 for this Media Entry Point.This property shall be mutually exclusive with contentType.The controlled vocabulary of media delivery protocols at this reference point is specified in clause 10 of TS 26.512 [6]. |  |
|  |  | profiles | array(Uri) | 0..1 | An optional list of conformance profile URIs with which this Media Entry Point is compliant.If present, the array shall contain at least one item. |  |
|  | eMBMS‌Service‌Announcement‌Locator | AbsoluteUrl | 0..1 | A pointer to an eMBMS User Service Announcement document. |  |
|  | mbs‌External‌Service‌Identifier | string | 0..1 | The external service identifier of an MBS User Service. |  |
| rtcClientConfiguration | object | 0..1 | Present if real-time media communication (RTC) is provisioned. | RTC |
|  | stunEndpoints | array(Client‌Service‌Endpoint‌Access‌Parameters) | 0..1 | An array of one or more trusted STUN service endpoints for use as ICE candidates. If present, the RTC Client shall use one of the listed servers for RTC-based media delivery sessions within the scope of provisioning‌SessionId.If the credentials sub-property was not provisioned at reference point M1, the Media AF shall populate this with a set of credentials unique to the requesting Media Client. |
|  | turnEndpoints | array(Client‌Service‌Endpoint‌Access‌Parameters) | 0..1 | An array of one or more trusted TURN service endpoints for use as ICE candidates. If present, the RTC Client shall use one of the listed servers for RTC-based media delivery sessions within the scope of provisioning‌SessionId.If the credentials sub-property was not provisioned at reference point M1, the Media AF shall populate this with a set of credentials unique to the requesting Media Client. |
|  | swapEndpoints | array(Client‌Service‌Endpoint‌Access‌Parameters) | 0..1 | An array of one or more trusted WebRTC Signalling Function service endpoints that support the SWAP protocol. If present, the RTC Client shall use one of the listed servers for RTC-based media delivery sessions within the scope of provisioning‌SessionId.If the credentials sub-property was not provisioned at reference point M1, the Media AF shall populate this with a set of credentials unique to the requesting Media Client. |
| clientConsumptionReporting‌Configuration | object | 0..1 | Present if consumption reporting is activated for this Provisioning Session. | MS\_DOWNLINK*,*RTC |
|  |  | reportingInterval | DurationSec | 0..1 | The time interval, expressed in seconds, between consumption report messages being sent by the consumption reporting entity. The value shall be greater than zero.When this property is omitted, a single final report shall be sent immediately after the media streaming session has ended. |  |
|  |  | serverAddresses | array(AbsoluteUrl) | 1..1 | A list of Media AF addresses (URLs) where the consumption reporting messages are sent by the consumption reporting entity. (See NOTE 1).Each address shall be an opaque base URL, following the format specified in clause 7.1.3 up to and including the {apiVersion} path element. |  |
|  |  | accessReporting | boolean | 1..1 | Indicates whether the consumption reporting entity is required to supply consumption reporting units whenever the access network changes during a media delivery session.Shall be set *false* if the accessReporting parameter is omitted from the Consumption‌Reporting‌Configuration, as specified in table 8.12.3.1‑1. |  |
|  |  | samplePercentage | Percentage | 1..1 | The percentage of media delivery sessions required to report consumption, expressed as a floating-point value between 0.0 and 100.0.Shall be set to 100.0 if the samplePercentage parameter is omitted from the Consumption‌Reporting‌Configuration, as specified in table 8.12.3.1‑1. |  |
| dynamicPolicyInvocation‌Configuration | object | 0..1 | Present if Policy Templates have been provisioned in the parent Provisioning Session and at least one of them is in the READY state. | MS\_DOWNLINK*,*MS\_UPLINK*,*RTC |
|  | serverAddresses | array(AbsoluteUrl) | 1..1 | A list of Media AF addresses (URLs) which offer the APIs for dynamic policy invocation. (See NOTE 1.)Each address shall be an opaque base URL, following the format specified in clause 7.1.3 up to and including the {apiVersion} path element. |  |
|  | policyTemplateBindings | array(object) | 1..1 | A list of duples, each one binding an external reference to a Policy Template resource identifier. |  |
|  |  | externalReference | string | 1..1 | Additional identifier for this Policy Template, unique within the scope of its Provisioning Session, that can be cross-referenced with external metadata about the media streaming session.Example: "HD\_Premium". |  |
|  |  | policyTemplateId | ResourceId | 1..1 | The resource identifier of a Policy Template tagged with externalReference that is in the READY state. |  |
|  |  | pduSetMarking | boolean | 0..1 | If *true*, indicates that PDU Set marking applies to Dynamic Policy Instances based on policyTemplateId.Default value false if omitted. |  |
|  |  | bdtWindows | array(BdtWindow) | 0..1 | A list of Background Data Transfer time windows during which the application may request the activation of a Background Data Transfer policy by instantiating the Policy Template identified by policyTemplateId. The actual usage quotas for data volume and bit rate are determined by the Media AF upon instantiation of the Policy Template.BdtWindow is specified in clause 7.3.3.14. |  |
|  |  | l4sEnablement | boolean | 0..1 | Indicates that ECN marking for L4S functionality is required to be enabled by the Media Access Function for media delivery sessions that instantiate this Policy Template.Default value false if omitted. |  |
|  |  | qoSMonitoring‌Required | boolean | 0..1 | Indicates that QoS monitoring functionality is required to be enabled by the Media Access Function for media delivery sessions that instantiate this Policy Template.Default value false if omitted. |  |
|  | sdfMethods | array(SdfMethod) | 1..1 | A list of Service Data Flow description methods, e.g. 5-tuple, TOS, 2-tuple, etc., to be used to describe the application flows at reference point M2 or M12 for media delivery sessions. |  |
| clientMetricsReporting‌Configurations | array(object) | 0..1 | Present if QoE metrics reporting is provisioned in the parent Provisioning Session.If present, contains one or more client metrics reporting configurations. | MS\_DOWNLINK*,*MS\_UPLINK*,*RTC |
|  | metricsReporting‌ConfigurationId | ResourceId | 1..1 | The identifier of this metrics reporting configuration, unique within the scope of the parent Provisioning Session.The value shall be the same as the corresponding identifier provisioned at reference point M1 (see clause 8.11.3.1). |
|  | serverAddresses | array(AbsoluteUrl) | 1..1 | A list of Media AF addresses to which metrics reports shall be sent. (See NOTE 1).Each address shall be an opaque base URL, following the format specified in clause 7.1.3 up to and including the {apiVersion} path element. |
|  | sliceScope | array(Snssai) | 0..1 | The set of network slice(s) for which metrics collection and reporting shall be executed in connection with this metrics reporting configuration (see NOTE 2).If present, the array shall identify at least one network slice.If absent, metrics shall be collected and reported for media delivery sessions within the scope of the parent Provisioning Session regardless of network slice. |
|  | scheme | Uri | 1..1 | A URI identifying the metrics scheme that metrics reports shall use (see clause 5.2.11).The set of QoE metrics schemes valid for use in 5G Media Streaming along with their respective scheme identifiers is specified in clauses 4.7.5 and 7.8.1 of TS 26.512 [6].The QoE metrics scheme valid for use in RTC along with its respective scheme identifier is specified in clause 15 of TS 26.113 [7]. |
|  | dataNetworkName | Dnn | 0..1 | The name of the Data Network which shall be used to send metrics reports.If not specified, the default Data Network shall be used. |
|  | reportingStartOffset | DurationSec | 0..1 | The time offset (expressed in seconds) from the start of a media delivery session when the metrics reporting entity is required to begin submitting metrics reports.If omitted, the value of this parameter is assumed to be zero, i.e., directing the Media Client to start reporting metrics from the start of the media delivery session. |
|  | reportingDuration | DurationSec | 0..1 | The period of time (expressed in seconds) measured relative to the reporting start point, after which the metrics reporting entity is required to stop reporting metrics.If omitted, reporting is required to continue until the end of the media delivery session. |
|  | reportingInterval | DurationSec | 0..1 | The time interval, expressed in seconds, between metrics reports being sent by the metrics reporting entity. The value shall be greater than zero.When this property is omitted, a single final report shall be sent immediately after the media streaming session has ended. |
|  | samplePercentage | Percentage | 1..1 | The percentage of media delivery sessions required to report QoE metrics, expressed as a floating-point value between 0.0 and 100.0. |
|  | positive‌Crossing‌Thresholds | map(Uri -> array(Float)) | 0..1 | If present, a non-empty map of QoE metrics to their respective threshold values.- The index of the associative array shall be the fully-qualified term identifier URI of a metric specified in annex E of TS 26.512 [6] or annex C of TS 26.113 [7].- The value of each associative array member shall be an array of floating-point threshold values.A metric in this associative array shall be reported once when its value exceeds one of the associated threshold values, and shall not be reported again until it falls below that threshold and subsequently exceeds it. |
|  | negative‌Crossing‌Thresholds | map(Uri -> array(Float)) | 0..1 | If present, a non-empty map of QoE metrics to their respective threshold values.- The index of the associative array shall be the fully-qualified term identifier URI of a metric specified in annex E of TS 26.512 [6] or annex C of TS 26.113 [7].- The value of each associative array member shall be an array of floating-point threshold values.A metric in this associative array shall be reported once when its value falls below one of the associated threshold values, and shall not be reported again until it exceeds that threshold and subsequently falls below it. |
|  | location‌Filter | array(LocationArea5G) | 0..1 | A list of one or more locations (see NOTE 3) where QoE metrics collection is required. When present, a Media Client shall collect metrics only when it is located in these locations and shall report them according to the other properties of the enclosing client metrics reporting configuration.If omitted, QoE metrics are to be collected and reported regardless of the UE location. |
|  | urlFilters | array(string) | 0..1 | A non-empty list of Media Entry Point URL patterns for which QoE metrics shall be reported. The format of each pattern shall be a regular expression as specified in [36].If not specified, reporting shall be done for all media delivery sessions. |
|  | samplingPeriod | DurationSec | 1..1 | The time interval the Media Client is required to wait between sampling the QoE metrics specified by this metrics reporting configuration. |
|  | metrics | array(Uri) | 0..1 | A list of one or more QoE metrics, each indicated by a fully-qualified term from a controlled vocabulary, which are to be reported.If omitted, the complete (or default if applicable) set of metrics associated with the specified scheme shall be collected and reported. |
| networkAssistance‌Configuration | object | 0..1 | Present if Network Assistance is provisioned in the parent Provisioning Session. | MS\_DOWNLINK*,*MS\_UPLINK*,*RTC |
|  | serverAddresses | array(AbsoluteUrl) | 1..1 | A list of Media AF addresses (URLs) that offer the APIs for AF-based Network Assistance at reference point M5. (See NOTE 1.)Each address shall be an opaque URL, following the format specified in clause 7.1.3 up to and including the {apiVersion} path element. |
| client‌EdgeResources‌Configuration | object | 0..1 | Present only for Provisioning Sessions with client-driven edge computing management mode provisioned. | MS\_DOWNLINK*,*MS\_UPLINK*,*RTC |
|  | eligibilityCriteria | Edge‌Processing‌Eligibility‌Criteria | 0..1 | Conditions for activating edge resources for media delivery sessions in the scope of the parent Provisioning Session. (See clause 7.3.3.10.) |
|  | easDiscoveryTemplate | EAS‌Discovery‌Template | 1..1 | A template for the EAS discovery filter that shall be used by the EEC to discover and select a Media EAS instance to serve media delivery sessions at reference point M4 in the scope of the parent Provisioning Session. (See clause 9.2.3.3.) |
|  | easRelocation‌Requirements | Client‌EAS‌Relocation‌Requirements | 0..1 | EAS relocation tolerance and requirements.If absent, the EEC shall assume that relocation is tolerated by all Media EAS instances in the scope of the parent Provisioning Session. (See clause 9.2.3.4.) |
| NOTE 1: In deployments where multiple instances of the Media AF expose the Media Session Handling APIs at reference point M5, the 5G System may use a suitable mechanism (e.g., HTTP load balancing or DNS-based host name resolution) to direct requests to a suitable Media AF instance.NOTE 2: The Snssai data type is specified in TS 29.571 [33].NOTE 3: The LocationArea5G data type is specified in TS 24.558 [14]. |

\* \* \* \* Next change \* \* \* \*

#### 11.3.1.2 Activate Dynamic Policy

The activatePolicy()method is invoked to request the application of a dynamic policy to a media delivery session that is configured at the Media Session Handler. The scope of the dynamic policy is all application flows that match the Media AS domain name declared when the media delivery session was created (see table 11.2.2.1‑1). The application may also provide the estimated transfer volume if the media delivery session is expected to be within the bounds of a Background Data Transfer time window.

The input parameters of the method are specified in table 11.3.1.2‑1.

Table 11.3.1.2-1: Input parameters for activatePolicy() method

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Type | O | Description |
| sessionId | string | M | The media delivery session identifier (as specified in clause 7.3.2) of an initialised media delivery session in the Media Session Handler. |
| serviceOperationPointReference | string | M | The external reference identifier of a Service Operation Point that uniquely identifies a Policy Template within the context of sessionId. |
| estimatedTransferVolume | integer | C | The estimated volume of data to be transferred, expressed in bytes.Minimum value 1 byte.Required to be populated when the Policy Template corresponding to the referenced Service Operation Point declares a Background Data Transfer policy. |

If the requested Service Operation Point identifies a Policy Template requiring ECN marking for L4S functionality (based on information provided in the Policy Template Binding of Service Access Information – see clause 5.3.2.1), the Media Session Handler shall send an L4S\_REQUIRED notification event (see table 11.3.2-2) to subscribers at reference points M6 and M11 and shall not proceed with instantiating the dynamic policy if any error notification is received.

The Media Session Handler conveys the request to the Media AF and provides the corresponding response to the invoker of the method.

The anonymous return value of the method is specified in table 11.3.1.2‑2.

Table 11.3.1.2-2: Return value for activatePolicy() method

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Type | O | Description |
| — | object | C | Information about the activated Dynamic Policy.Null if the method invocation is unsuccessful. |
|  | recommendedDownlinkBitRate | BitRate | M | The recommended downlink bit rate for the requested Service Operation Point. |
|  | recommendedUplinkBitRate | BitRate | M | The recommended uplink bit rate for the requested Service Operation Point. |
|  | grantedBackgroundDataTransferWindows | array(TimeWindow) | M | Indicates the time window(s) for which Background Data Transfer has been successfully activated. |
|  | l4SEnabled | boolean | M | Indicates whether ECN Marking for L4S functionality has been successfully activated by both the Media AF and by the Media Access Function for the media delivery session. |
|  | qoSMonitoringEnabled | boolean | M | Indicates whether QoS monitoring has been successfully activated by the Media AF for the media delivery session. |

If the requested Service Operation Point identifies a Policy Template requiring ECN marking for L4S functionality (based on information provided in the Policy Template Binding of Service Access Information – see clause 5.3.2.1) and if no error is received from the Media AF, the Media Session Handler shall send an L4S\_ENABLED notification event (see table 11.3.2-2) to subscribers at reference points M6 and M11.

\* \* \* \* Next change \* \* \* \*

### 11.3.2 Dynamic Policy information

Table 11.3.2-1 specifies the status information that can be obtained from the Media Session Handler.

Table 11.3.2-1: Status Information relating to Dynamic Policies

|  |  |  |  |
| --- | --- | --- | --- |
| Status | Type | Parameter | Definition |
| currentDynamicPolicies[mediaDeliverySession] | object |  | Descriptions of the Dynamic Policies currently instantiated for each current media delivery session, including the external reference identifier of its Service Operation Point, details of applicable Background Data Transfer quotas, if any, enablement of ECN marking for L4S functionality, enablement of QoS monitoring and the most recently received QoS monitoring results. |

Table 11.3.2-2 provides a list of general notification events exposed by the Media Session Handler.

Table 11.3.2-2: Notification Events relating to Dynamic Policies

|  |  |  |
| --- | --- | --- |
| Event | Definition | Payload |
| POLICY\_ACTIVATED | Triggered when a new Dynamic Policy is successfully activated for the media delivery session. | Media delivery session identifier,Service Operation Point reference,(Background Data Transfer window start,)(Background Data Transfer window end,)Recommended downlink bit rate,Recommended uplink bit rate*.* |
| POLICY\_DEACTIVATED | Triggered when the Dynamic Policy for this media delivery session is deactivated. | Media delivery session identifier,Service Operation Point reference. |
| BACKGROUND\_DATA\_TRANSFER\_OPPORTUNITY | Triggered when a new Background Data Transfer opportunity is notified to the Media Session Handler by the Media AF (see clause 10.2). | Media delivery session identifier,Service Operation Point reference,Background Data Transfer window start,Background Data Transfer window end. |
| L4S\_REQUIRED | Triggered when a Dynamic Policy requiring ECN marking for L4S functionality is about to be instantiated by the Media Session Handler. | Media delivery session identifier. |
| L4S\_ENABLED | Triggered when ECN Marking for L4S is successfully activated by the Media AF and by the Media Access Function for the media delivery session. | Media delivery session identifier. |
| QOS\_MONITORING\_ENABLED | Triggered when QoS monitoring is successfully activated by the Media AF for the media delivery session. | Media delivery session identifier |
| QOS\_MONITORING\_RESULTS | Triggered when QoS monitoring results are notified to the Media Session Handler by the Media AF. | Media delivery session identifier,QoS monitoring results. |

Table 11.3.3-3 provides a list of error events exposed by the Media Session Handler through reference points M6 and M11 in relation to Dynamic Policies.

Table 11.3.2-3: Error Events relating to Dynamic Policies

|  |  |  |
| --- | --- | --- |
| Status | Definition | Payload |
| ERROR\_INVALID\_‌SERVICE\_‌OPERATION\_‌POINT | Triggered when the provided Service Operation Point reference is not valid for the media delivery session. | Media delivery session identifier,Service Operation Point reference. |
| ERROR\_UNAUTHORISED | Triggered when the application is not authorised to instantiate a dynamic policy for the provided Service Operation Point reference. | Media delivery session identifier,Service Operation Point reference. |
| ERROR\_BACKGROUND\_DATA\_TRANSFER | Triggered when there is an error during a Background Data Transfer, for example if it is cancelled before the end of the advertised opportunity window. | Media delivery session identifier,Error reason. |
| ERROR\_L4S\_ACTIVATION | Triggered when the Media Session Handler is unable to activate ECN Marking for L4S in the Media Access Function according to RFC XXXX [ECN], for example because the Media Access Function does not support this feature or was unable to activate it. | Media delivery session identifier,Service Operation Point referenceError reason. |

\* \* \* \* End of changes \* \* \* \*