**3GPP TSG-WG SA4#133-e *S4-251268***

**Online, July 18 – 25, 2025 (revision of S4aI250092)**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **26.510** | **CR** | **0020** | **rev** | **5** | **Current version:** | **18.4.0** |  |
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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 |  | Radio Access Network |  | Core Network | **X** |

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|  |
| ***Title:***  | Stage 3 on Improved QoS Support for Media Streaming services |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** | AMD\_PRO-MED |  | ***Date:*** | 2025-04-08 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-19 |
|  | *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)* |
|  |  |
| ***Reason for change:*** | In FS\_AMD, several QoS features which could be beneficial to the Media Delivery System have been studied, including ECN marking for L4S, PDU Set handling and QoS monitoring. As concluded and recommended, this paper intends to integrate the ECN marking for L4S and QoS monitoring features into the procedures and protocols for both 5GMSd and 5GMSu. |
|  |  |
| ***Summary of change:*** | i. Integrate *ECN marking for L4S* into the procedures for both 5GMSd and 5GMSu.ii. Integrate the *QoS monitoring* feature into the procedures for both 5GMSd and 5GMSu.ii. Support other relevant aspects resulting from stage-2. |
|  |  |
| ***Consequences if not approved:*** | Support of ECN marking for L4S and QoS monitoring features are missing and WI is not complete. |
|  |  |
| ***Clauses affected:*** | 2, 3.3, 5.2.7.1, 5.3.2.1, 5.3.3.2, 5.4.3, 5.5.3.3A (new), 5.5.3.4, 7.3.3.6, 8.7.3.1, 9.2.3.1, 9.3.3.1, 10.2.3, 11.3.1.2, 11.3.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | SA4#131-bis-e: S4-250582r04\_BBC endorsed as S4-250660.SA4-(AH) MBS SWG post 132: merge the agreed S4-251117 from SA4#132.SA4#133-e: use the latest version of TS 26.510 as basis. |

\* \* \* \* 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".

[X1] IETF RFC 9330:"Low Latency, Low Loss, Scalable Throughput (L4S) Internet Service: Architecture".

[X2] IETF RFC 9331: "Explicit Congestion Notification (ECN) Protocol for Very Low Queuing Delay (L4S)".

[X3] IETF RFC 9332: "Dual-Queue Coupled Active Queue Management (AQM) for Low Latency, Low Loss, and Scalable Throughput (L4S)".

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

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

5GC 5G Core

AF Application Function

ANBR Access Network Bit rate Recommendation

API Application Programming Interface

AS Application Server

BDT Background Data Transfer

CHEM Coverage and Handoff Enhancements using Multimedia error robustness

DN Data Network

DS Differentiated Services

DSCP DS Code Point

EAS Edge Application Server

ECN Explicit Congestion Notification

EEC Edge Enabler Client

EES Edge Enabler Server

FQDN Fully Qualified Domain Name

GPSI Generic Public Subscription Identifier

ICE Interactive Connectivity Establishment

JSON JavaScript Object Notation

L4S Low Latency, Low Loss and Scalable Throughput

MFBR Maximum Flow Bit Rate

NEF Network Exposure Function

OAM Operations, Administration and Maintenance

PCC Policy Control and Charging

PCF Policy Control Function

PDR Packet Detection Rule

PHB Per-Hop Behaviour

QoE Quality of Experience

QoS Quality of Service

QFI QoS Flow Identifier

RTC Real-Time (media) Communication

STUN Session Traversal Utilities for NAT, Simple Traversal of User Datagram Protocol (UDP) through Network Address Translators

SWAP Simple WebRTC Application Protocol

TCP Transmission Control Protocol

TOS Type of Service

TURN Traversal Using Relays around NAT

UE User Equipment

URI Uniform Resource Identifier

URL Uniform Resource Locator

\* \* \* \* 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 prefers ECN marking for L4S functionality to be enabled according to RFC 9330 [X1], RFC 9331 [X2] and RFC 9332 [X3], the l4S‌Enablement‌Preference property shall be present and set to true. The Media AF shall reject the Policy Template if the Media AS does not support ECN marking for L4S functionality.

When a Policy Template prefers QoS monitoring functionality to be enabled, 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 l4S‌Enablement‌Preference property is present and set to true in a Policy Template to indicate that ECN marking for L4S functionality is preferred when it is instantiated, the corresponding Policy Template Binding shall include the l4S‌Enablement‌Preference flag set to the same value.

- If the qoSMonitoringConfiguration property is present in a Policy Template to indicate that QoS monitoring functionality is preferred when it is instantiated, the corresponding Policy Template Binding shall include the qoSMonitoring‌Enablement‌Preference 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 \* \* \* \*

#### 5.3.3.2 Create Dynamic Policy Instance resource operation

In order to instantiate a new dynamic policy, the Media Session Handler or Media AS (whichever is acting as Dynamic Policy invoker) shall first create a resource for the Dynamic Policy Instance in the Media AF. The Dynamic Policy invoker shall use the HTTP POST message for this purpose. The body of the HTTP POST message shall be a Dynamic Policy Instance resource representation that includes a Provisioning Session identifier, the resource identifier of the target Policy Template and a set of Service Data Flow descriptions identifying the application flow(s) to be policed.

1. The provisioningSessionId property associates the Dynamic Policy Instance resource with a Provisioning Session.

2. The policyTemplateId property uniquely identifies the Policy Template on which the Dynamic Policy Instance is based.

3. For each application flow to be managed by the Dynamic Policy Instance resource, an instance of the Application‌Flow‌Binding object shall be present in the application‌Flow‌Bindings array. The applicationFlow‌Description property of this object shall be populated by the Dynamic Policy invoker and shall declare a Service Data Flow template according to TS 23.503 [17] that describes application flow in question. Exactly one of the following filtering specifications shall be populated in the Application‌FlowDescription object to identify traffic belonging to a media delivery application flow:

- a packetFilter object (including 5-tuples, Type of Service, Security Parameter Index, etc.). A Media Client shall not attempt to instantiate more than one Dynamic Policy Instance at the same time that cites the same set of packet filters*.*

- a domainName populated with the fully-qualified Internet domain name of a Media AS at reference point M4*.* A Media Client shall not attempt to instantiate more than one Dynamic Policy Instance at the same time that cites the same domainName*.*

 In addition, the top-level media type of the application flow may be declared in the mediaType property.

 When the policy binding for the chosen Policy Template indicates that PDU Set marking is enabled (i.e., the pduSetMarking flag is set to true in Service Access Information), the Dynamic Policy invoker shall also populate the mediaTransportParameters property with the media transport protocol parameters to be used by the Media Access Function on the application flow in question to label uplink PDUs belonging to the same PDU Set and/or to indicate the last PDU in each PDU Set and/or to indicate the end of a data burst comprising one or more PDU Sets.

 When the policy binding for the chosen Policy Template indicates that PDU Set marking is not enabled (i.e., the pduSetMarking flag is set to false in Service Access Information) but specific QoS handling based on PDU Sets is nevertheless desired, the Dynamic Policy invoker shall also populate the mediaTransportParameters property with the media transport protocol parameters to be used by the Media Access Function on the application flow in question to indicate the RTP payload information for uplink PDUs which can be used to derive the PDU Set information.

NOTE: RTP payload information includes the RTP payload type and RTP payload format. The corresponding data type RtpPayloadInfo is specified in clause 5.5.4.15 of TS 29.571 [33].

 When the policy binding for the chosen Policy Template indicates that PDU Set marking is enabled (i.e., the pduSetMarking flag is set to true in Service Access Information), the Dynamic Policy invoker shall also populate the mediaTransportParameters property with the media transport protocol parameters to be used by the Media AS on the application flow in question to label downlink PDUs belonging to the same PDU Set and/or to indicate the last PDU in each PDU Set and/or to indicate the end of a data burst comprising one or more PDU Sets.

 When the policy binding for the chosen Policy Template indicates that PDU Set marking is not required (i.e., the pduSetMarking flag is set to false in Service Access Information) but specific QoS handling based on PDU Sets is nevertheless desired, the Dynamic Policy invoker shall also populate the mediaTransportParameters property with the media transport protocol parameters to be used by the Media AS on the application flow in question to indicate the RTP payload information for downlink PDUs which can be used to derive the PDU Set information.

4. When the Dynamic Policy invoker attempts to activate a QoS-related Policy Template, the qosSpecification property shall also be present in the Application‌Flow‌Binding object containing the following properties specified in clause 7.3.3.6 to describe the QoS requirements of the media application flows described by the bound applicationFlowDescription property:

- downlinkBitRates shall indicate the maximum requested bit rate, minimum desired bit rate and minimum requested bit rate in the downlink direction.

- uplinkBitRates shall indicate the maximum requested bit rate, minimum desired bit rate and minimum requested bit rate in the uplink direction.

- desiredPacketLatency may indicate the desired packet latency in both the downlink and uplink directions.

- desiredPacketLossRate may indicate the desired packet loss rate in both the downlink and uplink directions.

- desiredDownlinkPduSetQosParameters may be populated to indicate the desired delay budget and error rate for PDU Sets in the downlink direction, as well as indicating whether the loss of a single PDU in a PDU Set is significant for the receiving application.

- desiredUplinkPduSetQosParameters may be populated to indicate the desired delay budget and error rate for PDU Sets in the uplink direction, as well as indicating whether the loss of a single PDU in a PDU Set is significant for the receiving application.

- The l4SRequired flag may be set to true to require that ECN marking for L4S is enabled in the 5G System for the media delivery session. It is an error to create a Dynamic Policy with this feature required unless the l4SEnablementPreference property (see clause 5.2.7.1) is present and set to true in the Policy Template.

- The qoSMonitoringRequired flag may be set to true to require that QoS monitoring is enabled in the 5G System for the media delivery session. It is an error to create a Dynamic Policy with this feature required unless the qoSMonitoringConfiguration property (see clause 5.2.7.1) is present in the Policy Template.

5. When the Dynamic Policy invoker instantiates a Policy Template that is provisioned with a Background Data Transfer (BDT) specification per clause 5.2.7.1, the bdtSpecification property shall be present and it shall contain the following properties:

- estimatedDataTransferVolume, indicating the data volume that the Media Client estimates it will use during the current Background Data Transfer time window.

- Each object (see clause 7.3.3.14) conveyed in the windows array indicates a time window over which Background Data Transfers are requested by the Dynamic Policy invoker from those offered in the dynamic policy configuration of the Service Access Information resource (see clause 5.3.2.1).

- Each such window may additionally indicate the maximum bit rate for Background Data Transfers in the downlink and uplink directions that the Dynamic Policy invoker is bidding for in (respectively) the maximimumDownlinkBitRate and maximimumUplinkBitRate properties. In response, the Media AF populates these properties with the maximum permitted bit rate for Background Data Transfers in the downlink and uplink directions respectively when the dynamic policy is in force.

6. When the 5G System employs a traffic enforcement function to ensure that traffic complies with the policy described by the qosSpecification property, the Media AF shall explicitly indicate this in the Dynamic Policy resource representation by setting the qosEnforcement property to true.

If the operation is successful, the Media AF shall create a new Dynamic Policy Instance resource. In this case, the Media AF shall return a 201 (Created) HTTP response message to the Dynamic Policy invoker, and the URL of the newly created Dynamic Policy Instance resource, including its resource identifier, shall be provided as the value of the Location HTTP header field. The response message body shall be a representation of the current state of the Dynamic Policy Instance resource (see clause 9.3.3.1), including any properties assigned by the Media AF.

- The l4sEnabled property in the response message body shall be populated with the enablement status of ECN marking for L4S functionality in the 5G System.

- The qosMonitoringEnabled property in the response message body shall be populated with the enablement status of QoS monitoring in the 5G System.

Upon successful creation of the Dynamic Policy Instance resource, notifications of updates to the resource may be notified asynchronously to the Dynamic Policy invoker:

- If the notificationURL property is present in the Service Access Information, the Dynamic Policy invoker shall subscribe to the MQTT sub-topic corresponding to the resourceId of the Dynamic Policy Instance and shall expect to receive asynchronous notifications published by the Media AF on the MQTT notification channel of type NOTIFICATION\_‌DYNAMIC\_‌POLICY\_‌INSTANCE concerning changes to the Dynamic Policy Instance, including details about new Background Data Transfer opportunities.

- The Media AF shall use the MQTT notification channel signalled in the Service Access Information (if any, see clause 5.3.2.3) to notify the Dynamic Policy invoker subscriber about updates to the Dynamic Policy Instance resource. A notification message of type NOTIFICATION\_‌DYNAMIC\_‌POLICY\_‌INSTANCE shall be published to the MQTT sub-topic corresponding to the resourceId of the Dynamic Policy Instance.

The usage and message formats for the MQTT notification channel are specified in clause 10.2.

When the Dynamic Policy Instance is successfully instantiated, the Media AF triggers the creation of a corresponding PCC rule in the 5G System according to clause 5.5.3 to enforce the required QoS and/or charging policy on the specified application flow(s). Depending on the ApplicationFlowDescription objects in the received Dynamic Policy Instance resource representation and the filterMethod indicated by each one, the Media AF shall populate for each one a flowDescription object and/or provide an Application Identifier referring to a PFD (Packet Flow Description) object containing the domain name of a Media AS instance.

NOTE: When the Media AF is deployed in an external Data Network, it is the responsibility of the NEF to map any external Application Identifier supplied by the Media AF into an internal Application Identifier that is known to the PCF.

If the supplied Dynamic Policy Instance is not acceptable to the Media AF, the create operation shall fail with an HTTP response status code of 400 (Bad Request) and an error message body per clause 7.1.7. In this case, the Dynamic Policy Instance resource shall remain in an uncreated state in the Media AF.

If the request is acceptable but the Media AF forbids the instantiation of the referenced Policy Template, for example because the quota for Background Data Transfers has been exceeded or because the UE is not permitted in the charging specification, the create operation shall fail with an HTTP response status code of 403 (Forbidden) and an error message body per clause 7.1.7. In this case, the Dynamic Policy Instance resource shall remain in an uncreated state in the Media AF.

If the request is acceptable but the Media AF failed to enable ECN marking for L4S functionality in the 5G System when instantiating a dynamic policy with the l4SRequired property set to true, the create operation shall fail with an HTTP response status code of 500 (Internal Server Error) and an error message body per clause 7.1.7 with ProblemDetails.cause set to the string value ERROR\_L4S\_ENABLEMENT. In this case, the Dynamic Policy Instance resource shall be created in the Media AF without enabling ECN marking for L4S functionality.

If the request is acceptable but the Media AF failed to enable QoS monitoring functionality in the 5G System when instantiating a dynamic policy with the qosMonitoringRequired property set to true, the create operation shall fail with an HTTP response status code of 500 (Internal Server Error) and an error message body per clause 7.1.7 with ProblemDetailscause set to the string value ERROR\_QOS\_MONITORING\_ENABLEMENT. In this case, the Dynamic Policy Instance resource shall be created in the Media AF without enabling QoS monitoring functionality.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Dynamic Policy Instance for any other reason, the create operation shall fail with an HTTP response status code of 500 (Internal Server Error) and an error message body per clause 7.1.7. In this case, the Dynamic Policy Instance resource shall remain in an uncreated state in the Media AF.

If the Dynamic Policy invoker needs to instantiate several dynamic policies, it may invoke this operation as often as needed.

\* \* \* \* 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. In addition, the Media Session Handler may interrogate the capabilities of the Media Access Function. 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.

If the Media Access Function supports an L4S protocol stack, it shall subscribe to receive notifications from the Media Session Handler at reference point M11 concerning successful instantiation of Policy Templates that have ECN marking for L4S functionality 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 the L4S\_ENABLED notification to the Media Access Function at reference point M11 (see table 11.3.2-2) to inform it that ECN marking for L4S functionality has been successfully enabled for the corresponding media delivery session. The Media Access Function shall then enable ECN marking for L4S functionality.

If the Media Access Function is capable of consuming QoS monitoring results, it shall subscribe to receive notifications from the Media Session Handler at reference point M11 concerning successful instantiation of Policy Templates that have QoS monitoring 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 the QOS\_‌MONITORING\_‌ENABLED notification to the Media Access Function at reference point M11 (see table 11.3.2-2) 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 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 QOS\_‌MONITORING\_‌RESULTS notification to the Media Access Function at reference point M11 (see table 11.3.2-2). The Media Access Function may use the provided QoS monitoring results to adjust its media delivery behaviour at reference point M4.

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

#### 5.5.3.3A Mapping other Policy Control features

##### 5.3.3.3A.1 Enabling ECN marking for L4S

When instantiating a Policy Template that includes the l4SEnablement‌Preference 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.

##### 5.3.3.3A.2 Enabling QoS monitoring

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.

#### 5.5.3.4 Subscription to PCF notifications

For each of the Dynamic Policy Instances it is managing, the Media AF shall subscribe to the following PCF 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, for example in the case where 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].

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

#### 7.3.3.6 ClientQosSpecification type

Table 7.3.3.6-1: Definition of type ClientQosSpecification

|  |  |  |  |
| --- | --- | --- | --- |
| Property name | Data type | Cardinality | Description |
| downlinkBitRates | Unidirectional‌Bit‌Rate‌Specification | 1..1 | Bit rate specification for the downlink direction (see clause 7.3.3.5). |
| uplinkBitRates | Unidirectional‌Bit‌Rate‌Specification | 1..1 | Bit rate specification for the uplink direction (see clause 7.3.3.5). |
| desiredPacketLatency | number | 0..1 | Desired packet latency in milliseconds, expressed as a positive floating-point value (see NOTE 1). |
| desiredPacketLossRate | Packet‌Loss‌Rate | 0..1 | Desired packet loss rate expressed in tenths of a percent (see NOTE 1). |
| desiredDownlinkPduSetQosParameters | PDUSet‌Qos‌Para | 0..1 | Desired PDU Set QoS parameters for the downlink direction (see NOTE 2). |
| desiredUplinkPduSetQosParameters | PDUSet‌Qos‌Para | 0..1 | Desired PDU Set QoS parameters for the uplink direction (see NOTE 2). |
| l4S‌Required | boolean | 0..1 | Requirement to enable ECN marking for L4S functionality for the media delivery session. |
| *qoSMonitoring‌Required* | boolean | 0..1 | Requirement to enable QoS monitoring functionality for the media delivery session. |
| NOTE 1: Clause 5.6.2.7 of TS 29.514 [18] restricts packet latency and packet loss to be the same in the downlink and uplink directions for a given MediaComponent when the CHEM feature is not supported by the PCF.NOTE 2: Data type PDUSetQosPara is specified in clause 5.5.4.11 of TS 29.571 [33]. |

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

#### 8.7.3.1 PolicyTemplate resource

Table 8.7.3.1-1: Definition of PolicyTemplate resource

| Property | Type | Cardinality | Usage | Description |
| --- | --- | --- | --- | --- |
| policyTemplateId | ResourceId | 1..1 | C: ROR: ROU: RO | Resource identifier of this Policy Template assigned by the Media AF that is unique within the scope of the Provisioning Session. |
| state | string enum | 1..1 | C: ROR: ROU: RO | Current state of this Policy Template (see clause 5.2.7.2) exposed to the 5GMS Application Provider by the Media AF.Only a Policy Template in the READY state may be instantiated as a Dynamic Policy Instance and applied to media streaming sessions. |
| stateReason | Problem‌Details | 1..1 | C: ROR: ROU: RO | Additional details about the current state of this Policy Template exposed to the Media Application Provider by the Media AF.The instance sub-property shall be present and shall indicate the URL of this Policy Template resource at reference point M1.The title sub-property shall be present and shall indicate a human-readable representation of the *state* property specified above, e.g., "Policy Template ready for use" or "Policy Template invalid".The detail sub-property shall be present and shall indicate a human-readable status/error message.All other properties shall be omitted. |
| externalReference | string | 1..1 | C: RWR: RWU: RW | Additional identifier for this Policy Template, unique within the scope of its Provisioning Session, that may be cross-referenced with external metadata about a media delivery session.Example: "HD\_Premium". |
| application‌Session‌Contexts | array(object) | 0..1 | C: RWR: RWU: RW | Exactly one application session context at reference point M4 to which this Policy Template may be applied.Each object in the array shall specify at least one property. If more than one property is specified, instantiation of the Policy Template is restricted to the conjunction of all the object's properties. |
|  | sliceInfo | Snssai | 0..1 | C: RWR: RWU: RW | A Network Slice on which this Policy Template may be instantiated. (See clause 5.4.4.2 of TS 29.571 [33].) |
|  | dnn | Dnn | 0..1 | C: RWR: RWU: RW | A Data Network on which this Policy Template may be instantiated. (See clause 7.3.2.) |
| qoSSpecifications | array(Qos‌Range) | 0..1 | C: RWR: RWU: RW | The network Quality of Service policy limits to be applied to the application service component(s) of media delivery sessions that instantiate this Policy Template (see NOTE and clause 7.3.3.4).Each member of the array is identified by a component reference that is unique in this array.If present, the array shall contain at least one object. |
| charging‌Specification | Charging‌Specification | 0..1 | C: RWR: RWU: RW | The charging policy to be applied to media delivery sessions that instantiate this Policy Template is instantiated (see NOTE and clause 7.3.3.7). |
| bdtPolicyId | BdtReferenceId | 0..1 | C: RWR: ROU: RW | A reference to an existing Background Data Transfer policy in the PCF (see NOTE 1).Mutually exclusive with bdtSpecification. |
| bdtSpecification | Bdt‌Policy‌Schedule | 0..1 | C: RWR: ROU: RW | The Background Data Transfer policy specification to be associated with media delivery sessions that instantiate this Policy Template (see clause 8.7.3.2).Mutually exclusive with bdtPolicyId property. |
| l4SEnablementPreference | boolean | 0..1 | C: RWR: ROU: RW | If true, indicates a preference that ECN marking for L4S functionality is enabled in the Media Delivery System for media delivery sessions that instantiate this Policy Template.Default value false if omitted. |
| qoSMonitoring‌Configuration | Qos‌Monitoring‌Information | 0..1 | C: RWR: ROU: RW | If present, indicates a preference that QoS monitoring functionality is enabled in the Media Delivery System for media delivery sessions that instantiate this Policy Template. When this feature is enabled, QoS monitoring configuration is provided to the PCF/NEF (NOTE 2). |
| NOTE 1: Data type BdtReferenceId is specified in TS 29.122 [20].NOTE 2: Data type QosMonitoringInformation is specified in TS 29.122 [20]. |

At least one of the following properties shall be present: qosSpecification, chargingSpecification, bdtPolicyId, bdtSpecification.

\* \* \* \* 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. |  |
|  |  | l4sEnablement‌Preference | boolean | 0..1 | Indicates a preference that ECN marking for L4S functionality is enabled by the Media Session Handler for media delivery sessions that instantiate this Policy Template.Default value false if omitted. |  |
|  |  | qoSMonitoring‌Enablement‌Preference | boolean | 0..1 | Indicates a preference that QoS monitoring functionality is enabled by the Media Session Handler 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 \* \* \* \*

#### 9.3.3.1 DynamicPolicy resource

Table 9.3.3.1-1: Definition of Dynamic Policy Instance resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Property name | Data type | Cardinality | Usage | Description |
| dynamicPolicyId | ResourceId | 1..1 | RO | Unique identifier for this Dynamic Policy Instance assigned by the Media AF when the resource is created. |
| provisioningSessionId | ResourceId | 1..1 | C: ROR: ROU: RO | Uniquely identifies the parent Provisioning Session, which is linked to the Application Service Provider. |
| session‌Id | MediaDelivery‌SessionId | 1..1 | C: RWR:ROU: RO | Unique identifier of the current media delivery session. |
| policyTemplateId | ResourceId | 1..1 | C: RWR: ROU: RW | Identifies the Policy Template to be applied to the application flow(s) that fall within the scope of this Dynamic Policy Instance. |
| sliceInfo | Snssai | 0..1 | C: RWR: ROU: RW | Identifying the target slice in which the Policy Template is instantiated. |
| dataNetworkName | Dnn | 0..1 | C: RWR: ROU: RW | The name of the target Data Network in which the Policy Template is instantiated. |
| location | TypedLocation | 0..1 | C: RWR: ROU: RW | The location of the UE when the Dynamic Policy was created or last updated. |
| applicationFlowBindings | array(Application‌FlowBinding) | 1..1 | C: RWR: ROU: RW | The bindings between application flows at reference point M4 managed within the scope of this Dynamic Policy Instance and their network Quality of Service requirements (see clause 9.3.3.2).The array shall contain at least one member. |
|  | componentReference | string | 1..1 | C: RWR: ROU: RW | References a particular service component in the Policy Template. |
|  | application‌Flow‌Description | Application‌Flow‌Description | 1..1 | C: RWR: ROU: RW | The Dynamic Policy invoker's specification of an application flow managed by this Dynamic Policy to be used for application traffic identification purposes in the 5G Core (see clause 7.3.3.2).When PDU Set handling is enabled for the Policy Template identified by policyTemplateId, this property shall also specify the media transport protocol parameters to be used by the Media Access Function for PDU Set signalling purposes. |
|  | qos‌Specification | Client‌Qos‌Specification | 0..1 | C: RWR: ROU: RW | The Dynamic Policy invoker's network Quality of Service requirements of the application flow described by application‌Flow‌Description.If omitted, the default provisioned network Quality of Service requirements of the Policy Template indicated in policyTemplateId shall apply to application‌Flow‌Description. |
| bdtSpecification | Client‌Bdt‌Specification | 0..1 | C: RWR: ROU: RW | The Background Data Transfer time windows and traffic limits that apply to this Dynamic Policy (see clause 9.3.3.3). |
| qosEnforcement | boolean | 1..1 | C: ROR: ROU: RO | Indication that the Quality of Service described in qosSpecification is being enforced by the 5G System.Populated by the Media AF. |
| l4SEnabled | boolean | 1..1 | C: ROR: ROU: RO | Indication that ECN marking for L4S functionality is enabled in the 5G System.Populated by the Media AF. |
| qoSMonitoringEnabled | boolean | 1..1 | C: ROR: ROU: RO | Indication that QoS monitoring is enabled in the 5G System.Populated by the Media AF. |
| qoSMonitoringResults | QosMonitoringReport | 0..1 | C: ROR: ROU: RO | The most recent QoS monitoring results provided by the 5G System. Present only if this feature is currently enabled (as indicated by the qoSMonitoringEnabled property above).Populated by the Media AF. |
| NOTE: Data type QosMonitoringReport is defined in TS 29.122 [20]. |

\* \* \* \* 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 \* \* \* \*

#### 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. |

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

The Media Session Handler may enable ECN marking for L4S and/or QoS monitoring as a side-effect of this method (see clause 5.3.3.2).

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. |

The Media Session Handler shall additionally send the L4S\_ENABLED notification (see table 11.3.2-2) if the l4SEnabled flag above is true.

The Media Session Handler shall additionally send the QOS\_MONITORING\_ENABLED notification (see table 11.3.2-2) if the qoSMonitoringEnabled flag above is true.

\* \* \* \* 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\_ENABLED | Triggered when the Media AF confirms that ECN Marking for L4S is successfully activated in the 5G System for the media delivery session. | Media delivery session identifier. |
| QOS\_MONITORING\_ENABLED | Triggered when the Media AF confirms that QoS monitoring is successfully activated in the 5G System 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\_ENABLEMENT | Triggered when the 5G System failed to enable ECN marking for L4S functionality when instantiating a dynamic policy for the provided Service Operation Point reference. The dynamic policy is instantiated without this functionality. | Media delivery session identifier,Error reason. |
| ERROR\_QOS\_MONITORING\_ENABLEMENT | Triggered when the 5G System failed to enable QoS monitoring functionality when instantiating a dynamic policy for the provided Service Operation Point reference. The dynamic policy is instantiated without this functionality. | Media delivery session identifier,Error reason. |

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