



**5G;
Media delivery;
interactions and APIs for provisioning and media session
handling
(3GPP TS 26.510 version 19.1.0 Release 19)**



ReferenceRTS/TSGS-0426510vj10

Keywords5G

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

Important notice

The present document can be downloaded from the
[ETSI Search & Browse Standards](#) application.

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format on [ETSI deliver](#) repository.

Users should be aware that the present document may be revised or have its status changed,
this information is available in the [Milestones listing](#).

If you find errors in the present document, please send your comments to
the relevant service listed under [Committee Support Staff](#).

If you find a security vulnerability in the present document, please report it through our
[Coordinated Vulnerability Disclosure \(CVD\)](#) program.

Notice of disclaimer & limitation of liability

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2026.
All rights reserved.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the [ETSI IPR online database](#).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™**, **LTE™** and **5G™** logo are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

Legal Notice

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found at [3GPP to ETSI numbering cross-referencing](#).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights	2
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	10
1 Scope	12
2 References	12
3 Definitions of terms, symbols and abbreviations	14
3.1 Terms.....	14
3.2 Symbols.....	14
3.3 Abbreviations	15
4 Functions and roles.....	15
4.1 Media Application Provider	15
4.2 Media AF.....	16
4.3 Media Session Handler.....	17
5 Interactions	18
5.1 Summary	18
5.2 Provisioning (M1) interactions.....	20
5.2.1 Overview	20
5.2.2 Provisioning Session provisioning.....	21
5.2.2.1 General	21
5.2.2.2 Enumerate Provisioning Sessions collection operation.....	21
5.2.2.3 Create Provisioning Session resource operation	22
5.2.2.4 Retrieve Provisioning Session resource operation	22
5.2.2.5 Update Provisioning Session resource operation	22
5.2.2.6 Destroy Provisioning Session resource operation	22
5.2.3 Content protocols discovery	22
5.2.3.1 General	22
5.2.3.2 Create Content Protocols resource operation	23
5.2.3.3 Retrieve Content Protocols resource operation.....	23
5.2.3.4 Update Content Protocols resource operation	23
5.2.3.5 Destroy Content Protocols resource operation.....	23
5.2.4 Server Certificate provisioning.....	23
5.2.4.1 General	23
5.2.4.2 Create Server Certificate resource operation.....	24
5.2.4.3 Reserve Server Certificate resource operation	24
5.2.4.4 Upload Server Certificate resource operation	25
5.2.4.5 Retrieve Server Certificate resource operation.....	25
5.2.4.6 Update Server Certificate resource operation.....	25
5.2.4.7 Destroy Server Certificate resource operation	26
5.2.5 Content Preparation provisioning	26
5.2.5.1 General	26
5.2.5.2 Create Content Preparation Template resource operation.....	26
5.2.5.3 Retrieve Content Preparation Template resource operation.....	27
5.2.5.4 Update Content Preparation Template resource operation.....	27
5.2.5.5 Destroy Content Preparation Template resource operation.....	27
5.2.6 Edge Resources provisioning.....	28
5.2.6.1 General	28
5.2.6.2 Create Edge Resources Configuration resource operation	28
5.2.6.3 Retrieve Edge Resources Configuration resource operation.....	28
5.2.6.4 Update Edge Resources Configuration resource operation.....	28
5.2.6.5 Destroy Edge Resources Configuration resource operation.....	29
5.2.7 Dynamic Policy provisioning	29
5.2.7.1 General.....	29

5.2.7.2	Policy Template life-cycle	31
5.2.7.3	Create Policy Template resource operation.....	32
5.2.7.4	Retrieve Policy Template resource operation.....	33
5.2.7.5	Update Policy Template resource operation.....	33
5.2.7.6	Destroy Policy Template resource operation	33
5.2.8	Content Hosting provisioning.....	34
5.2.8.1	General	34
5.2.8.2	Create Content Hosting Configuration resource operation	34
5.2.8.3	Retrieve Content Hosting Configuration resource operation	37
5.2.8.4	Update Content Hosting Configuration resource operation	37
5.2.8.5	Destroy Content Hosting Configuration resource operation	37
5.2.8.6	Purge Content Hosting cache operation	37
5.2.9	Content Publishing provisioning.....	38
5.2.9.1	General	38
5.2.9.2	Create Content Publishing Configuration resource operation	38
5.2.9.3	Retrieve Content Publishing Configuration resource operation.....	40
5.2.9.4	Update Content Publishing Configuration resource operation.....	40
5.2.9.5	Destroy Content Publishing Configuration resource operation.....	41
5.2.9.6	Purge Content Publishing cache operation.....	41
5.2.10	Real-time Media Communication provisioning.....	41
5.2.10.1	General	41
5.2.10.2	Create Real-time Media Communication Configuration resource operation	42
5.2.10.3	Retrieve Real-time Media Communication Configuration resource operation	42
5.2.10.4	Update Real-time Media Communication Configuration resource operation	42
5.2.10.5	Destroy Real-time Media Communication Configuration resource operation.....	43
5.2.11	Metrics Reporting provisioning	43
5.2.11.1	General	43
5.2.11.2	Create Metrics Reporting Configuration resource operation	44
5.2.11.3	Retrieve Metrics Reporting Configuration resource operation	44
5.2.11.4	Update Metrics Reporting Configuration resource operation	44
5.2.11.5	Destroy Metrics Reporting Configuration resource operation	45
5.2.12	Consumption Reporting provisioning.....	45
5.2.12.1	General	45
5.2.12.2	Create Consumption Reporting Configuration resource operation	45
5.2.12.3	Retrieve Consumption Reporting Configuration resource operation	45
5.2.12.4	Update Consumption Reporting Configuration resource operation	46
5.2.12.5	Destroy Consumption Reporting Configuration resource operation	46
5.2.13	Event Data Processing provisioning	46
5.2.13.1	General	46
5.2.13.2	Create Event Data Processing Configuration resource operation.....	46
5.2.13.3	Retrieve Event Data Processing Configuration resource operation	47
5.2.13.4	Update Event Data Processing Configuration resource operation	47
5.2.13.5	Destroy Event Data Processing Configuration resource operation	48
5.3	Network media session handling (M3, M5) interactions.....	48
5.3.1	Overview	48
5.3.2	Service Access Information acquisition.....	48
5.3.2.1	General	48
5.3.2.2	Create Service Access Information resource operation.....	49
5.3.2.3	Retrieve Service Access Information resource operation.....	49
5.3.2.4	Update Service Access Information resource operation.....	50
5.3.2.5	Destroy Service Access Information resource operation	50
5.3.3	Dynamic Policy invocation.....	50
5.3.3.1	Procedures.....	50
5.3.3.2	Create Dynamic Policy Instance resource operation.....	51
5.3.3.3	Retrieve Dynamic Policy Instance resource operation.....	54
5.3.3.4	Update Dynamic Policy Instance resource operation.....	54
5.3.3.5	Destroy Dynamic Policy Instance resource operation.....	55
5.3.4	Network Assistance invocation.....	55
5.3.4.1	Procedures.....	55
5.3.4.2	Create Network Assistance Session resource operation.....	56
5.3.4.3	Retrieve Network Assistance Session resource operation.....	57
5.3.4.4	Bit rate recommendation request operation.....	58

5.3.4.5	Delivery boost request operation.....	58
5.3.4.6	Update Network Assistance Session resource operation.....	58
5.3.4.7	Destroy Network Assistance Session resource operation.....	59
5.3.5	Metrics reporting	59
5.3.5.1	Procedures.....	59
5.3.5.2	Submit metrics report operation	61
5.3.6	Consumption reporting	61
5.3.6.1	Procedures.....	61
5.3.6.2	Submit consumption report operation	63
5.4	UE media session handling (M6, M11) interactions	63
5.4.1	Overview	63
5.4.2	Media delivery session life-cycle.....	64
5.4.2.1	Explicit media session handling initiation/termination	64
5.4.2.2	Implicit media session handling initiation/termination	64
5.4.3	Dynamic Policy invocation.....	65
5.4.4	Network Assistance invocation.....	65
5.4.5	Metrics reporting	66
5.4.6	Consumption reporting	66
5.5	5GC policy control (N5/N33) interactions	66
5.5.1	Overview	66
5.5.2	Policy control interactions for Policy Template provisioning	66
5.5.3	Policy control interactions for Dynamic Policies.....	67
5.5.3.1	General	67
5.5.3.2	Mapping of Background Data Transfer parameters	68
5.5.3.3	Mapping of application-specific PDU handling parameters	68
5.5.3.3.1	Mapping of media transport parameters to Protocol Description.....	68
5.5.3.3.2	Mapping of PDU Set QoS parameters.....	69
5.5.3.3.3	Mapping of dynamic traffic characteristics parameters.....	70
5.5.3.3.4	Mapping of multiplexed media flow information.....	70
5.5.3.3A	Mapping other Policy Control features	71
5.5.3.3A.1	Enabling ECN marking for L4S	71
5.5.3.3A.2	Enabling QoS monitoring.....	71
5.5.3.4	Subscription to PCF notifications	71
5.5.4	Policy control interactions for AF-based Network Assistance	72
5.6	UE modem interactions	73
5.6.1	Overview	73
5.6.2	ANBR-based Network Assistance	73
5.6.3	RAN-based metrics reporting	74
6	3GPP Service URL.....	74
6.1	General	74
6.2	3GPP Service URL syntax	74
6.3	Handling of 3GPP Service URLs by Media Client	75
7	General aspects of network APIs	75
7.1	Usage of HTTP.....	75
7.1.1	HTTP protocol version	75
7.1.2	HTTP endpoint addresses	76
7.1.2.1	Default Media AF endpoint address at reference point M1	76
7.1.2.2	Default Media AF endpoint address at reference point M3	76
7.1.2.3	Default Media AF endpoint address at reference point M5	76
7.1.3	HTTP resource URIs and paths	76
7.1.4	Usage of HTTP headers.....	76
7.1.4.1	General.....	76
7.1.4.2	User Agent identification.....	76
7.1.4.3	Server identification.....	76
7.1.4.2	Cache control	77
7.1.4.3	Support for conditional HTTP GET requests.....	77
7.1.4.4	Support for conditional HTTP POST, PUT, PATCH and DELETE requests.....	77
7.1.5	HTTP message bodies for API resources	77
7.1.6	HTTP response codes	77
7.1.7	HTTP error response message bodies.....	77

7.2	Explanation of API data model notation	78
7.3	Common OpenAPI data types	78
7.3.1	General.....	78
7.3.2	Simple data types.....	79
7.3.3	Structured data types.....	80
7.3.3.1	IpPacketFilterSet type	80
7.3.3.2	ApplicationFlowDescription type	80
7.3.3.3	UnidirectionalQosSpecification type	81
7.3.3.4	PolicyConstraints type	81
7.3.3.5	UnidirectionalBitRateSpecification type.....	82
7.3.3.6	ClientPolicySpecification type	82
7.3.3.7	ChargingSpecification type	82
7.3.3.8	TypedLocation type	83
7.3.3.9	OperationSuccessResponse type	83
7.3.3.10	EdgeProcessingEligibilityCriteria type	83
7.3.3.11	EndpointAddress type	84
7.3.3.12	RelativeMediaEntryPoint type	84
7.3.3.13	CachingConfiguration type	84
7.3.3.14	BdtWindow type	85
7.3.4	Enumerated data types	85
7.3.4.1	CellIdentifierType enumeration	85
7.3.4.2	SdfMethod enumeration	85
7.3.4.3	ProvisioningSessionType enumeration	85
7.3.4.4	EASRelocationTolerance enumeration	86
7.3.4.5	ContentTransferMode enumeration	86
7.4	Security	86
7.4.1	General.....	86
7.4.2	Authorising access to provisioning APIs on the Media AF	86
7.4.3	Authorising access to media session handling APIs on the Media AF	87
8	Maf_Provisioning service.....	89
8.1	Overview	89
8.2	Provisioning Sessions API	91
8.2.1	Overview	91
8.2.2	Resource structure.....	91
8.2.3	Data model.....	91
8.2.3.1	ProvisioningSession resource.....	91
8.3	Content Protocols Discovery API	95
8.3.1	Overview	95
8.3.2	Resource structure.....	95
8.3.3	Data model.....	96
8.3.3.1	ContentProtocols resource	96
8.3.3.2	ContentProtocolDescriptor type.....	96
8.4	Server Certificates provisioning API.....	97
8.4.1	Overview	97
8.4.2	Resource structure.....	97
8.4.3	Data model.....	98
8.4.3.1	Certificate Signing Request.....	98
8.4.3.2	Server Certificate resource	98
8.5	Content Preparation Templates provisioning API.....	99
8.5.1	Overview	99
8.5.2	Resource structure.....	99
8.5.3	Data model.....	99
8.6	Edge Resources provisioning API.....	100
8.6.1	General.....	100
8.6.2	Resource structure.....	100
8.6.3	Data model.....	101
8.6.3.1	EdgeResourcesConfiguration resource type	101
8.6.3.2	EdgeManagementMode enumeration.....	101
8.6.3.3	EASRequirements type	102
8.6.3.4	M1EASRelocationRequirements type	102
8.7	Policy Templates provisioning API.....	103

8.7.1	Overview	103
8.7.2	Resource structure.....	103
8.7.3	Data model.....	104
8.7.3.1	PolicyTemplate resource	104
8.7.3.2	BdtPolicySchedule type	106
8.8	Content Hosting provisioning API	107
8.8.1	Overview	107
8.8.2	Resource structure.....	107
8.8.3	Data model.....	108
8.8.3.1	ContentHostingConfiguration resource.....	108
8.8.3.2	DistributionNetworkType enumeration	112
8.8.3.3	DistributionMode enumeration	113
8.9	Content Publishing provisioning API.....	114
8.9.1	Overview	114
8.9.2	Resource structure.....	114
8.9.3	Data model.....	115
8.9.3.1	ContentPublishingConfiguration resource	115
8.10	Real-time Media Communication provisioning API.....	119
8.10.1	Overview	119
8.10.2	Resource structure.....	119
8.10.3	Data model.....	120
8.10.3.1	RTCCConfiguration resource	120
8.10.3.2	ServiceEndpointAccessSpecification.....	120
8.11	Metrics Reporting provisioning API	122
8.11.1	Overview	122
8.11.2	Resource structure.....	122
8.11.3	Data model.....	123
8.11.3.1	MetricsReportingConfiguration resource	123
8.12	Consumption Reporting provisioning API	126
8.12.1	Overview	126
8.12.2	Resource structure.....	126
8.12.3	Data model.....	127
8.12.3.1	ConsumptionReportingConfiguration resource.....	127
8.13	Event Data Processing provisioning API	128
8.13.1	General.....	128
8.13.2	Resource structure.....	128
8.13.3	Data model.....	129
8.13.3.1	EventDataProcessingConfiguration resource type	129
9	Maf_SessionHandling service.....	130
9.1	Overview	130
9.2	Service Access Information API	131
9.2.1	General.....	131
9.2.2	Resource structure.....	131
9.2.3	Data model.....	132
9.2.3.1	ServiceAccessInformation resource type	132
9.2.3.2	ClientServiceEndpointAccessParameters	138
9.2.3.3	EASDiscoveryTemplate type	139
9.2.3.4	ClientEASRelocationRequirements type	139
9.3	Dynamic Policy API.....	140
9.3.1	Overview	140
9.3.2	Resource structure.....	140
9.3.3	Data model.....	141
9.3.3.1	DynamicPolicy resource	141
9.3.3.2	ApplicationFlowBinding.....	143
9.3.3.3	ClientBdtSpecification type	143
9.4	Network Assistance API	144
9.4.1	Overview	144
9.4.2	Resource structure.....	144
9.4.3	Data model.....	145
9.4.3.1	NetworkAssistanceSession resource	145
9.5	Metrics Reporting API	146

9.5.1	General.....	146
9.5.2	Reporting procedure	146
9.5.3	Report format.....	146
9.5.3.1	General	146
9.5.3.2	JSON-based metrics reporting envelope	146
9.6	Consumption Reporting API	148
9.6.1	General.....	148
9.6.2	Reporting procedure	148
9.6.3	Report format.....	149
9.6.3.1	ConsumptionReport type	149
9.6.3.2	ConsumptionReportingUnit type	150
10	Ancillary network media session handling services.....	151
10.1	Overview	151
10.2	Resource update notification channel.....	151
10.2.1	General.....	151
10.2.2	Topic structure of notification channel	151
10.2.3	Notification message format	151
11	UE media session handling APIs	153
11.1	Introduction	153
11.2	Media Session Handler client API.....	153
11.2.1	Media Session Handler internal properties	153
11.2.2	General Media Session Handler methods	154
11.2.2.1	Create a media delivery session	154
11.2.2.2	Destroy a media delivery session	155
11.2.3	General Media Session Handler information	155
11.3	Dynamic Policy client API	157
11.3.1	Dynamic Policy methods	157
11.3.1.1	Retrieve Background Data Transfer information	157
11.3.1.2	Activate Dynamic Policy	158
11.3.2	Dynamic Policy information.....	159
11.4	Network Assistance client API.....	161
11.4.1	Network Assistance methods.....	161
11.4.1.1	Bit rate recommendation request.....	161
11.4.1.2	Delivery boost request.....	161
11.4.2	Network Assistance information.....	162
11.5	Consumption Reporting API	164
11.5.1	Consumption Reporting methods	164
11.5.2	Consumption Reporting information	164
11.6	Metrics Reporting client API.....	165
11.6.1	Metrics Reporting methods.....	165
11.6.2	Metrics Reporting information	165
Annex A (normative): OpenAPI representation of HTTP REST APIs.....		167
A.1	General	167
A.2	Data Types applicable to several APIs.....	167
A.3	OpenAPI representation of Maf_Provisioning APIs.....	167
A.3.1	Maf_Provisioning_ProvisioningSessions API	167
A.3.2	Maf_Provisioning_ContentProtocols API.....	167
A.3.3	Maf_Provisioning_ServerCertificates API.....	167
A.3.4	Maf_Provisioning_ContentPreparationTemplates API	167
A.3.5	Maf_Provisioning_EdgeResources API	167
A.3.6	Maf_Provisioning_PolicyTemplates API.....	168
A.3.7	Maf_Provisioning_ContentHosting API	168
A.3.8	Maf_Provisioning_ContentPublishing API.....	168
A.3.9	Maf_Provisioning_RealTimeCommunication API	168
A.3.9	Maf_Provisioning_MetricsReporting API	168
A.3.10	Maf_Provisioning_ConsumptionReporting API	168
A.3.11	Maf_Provisioning_EventDataProcessing API.....	168

A.4	OpenAPI representation of Maf_SessionHandling APIs	168
A.4.1	Maf_SessionHandling_ServiceAccessInformation API.....	168
A.4.2	Maf_SessionHandling_DynamicPolicy API	168
A.4.3	Maf_SessionHandling_NetworkAssistance API	169
A.4.4	Maf_SessionHandling_MetricsReporting API.....	169
A.4.5	Maf_SessionHandling_ConsumptionReporting API.....	169
A.5	OpenAPI representation of ancillary network media session handling services	169
A.5.1	Resource update notification channel.....	169
Annex B (normative): Controlled vocabularies		170
B.1	Locator type.....	170
Annex C (informative): Usage of TOS/DSCP for traffic identification		171
C.1	General	171
C.2	Differentiated Services/TOS-enabled Collaboration Scenarios	171
C.3	Procedure for using TOS Traffic Class for traffic identification.....	172
Annex D (informative): QoS mappings at reference point N5/N33		176
D.1	QoS mappings for Dynamic Policy	176
D.1.1	General	176
D.1.2	QoS mapping for Dynamic Policy at reference point N5.....	177
D.1.3	QoS mapping for Dynamic Policy at reference point N33	180
Annex E (normative): IANA registrations		182
E.1	General	182
E.2	Registration of MIME media type for JSON-based media delivery metrics reporting envelope.....	182
E.2.1	General	182
E.2.2	Version parameter	183
Annex F (informative): Change history.....		184
History		185

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

- shall** indicates a mandatory requirement to do something
- shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

- should** indicates a recommendation to do something
- should not** indicates a recommendation not to do something
- may** indicates permission to do something
- need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

- can** indicates that something is possible
- cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

- will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document specifies:

1. The operations and corresponding APIs used by a Media Application Provider to interact with a Media AF component to provision the delivery of media in a Media Delivery System.
2. The operations and corresponding APIs used by a Media Session Handler component to interact with a provisioned Media AF for the purpose of managing media delivery sessions ("media session handling").
3. The operations and corresponding APIs used by a Media-aware Application running in a UE or by a Media Access Client component to interact with a Media Session Handler for the purpose of initiating a media delivery session and for controlling it.

The Media Delivery System may be:

- a 5G Media Streaming (5GMS) System, as specified in TS 26.512 [6]; and/or
- a Real-Time media Communication (RTC) System, as specified in TS 26.113 [7].

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] IETF RFC 7519: "JSON Web Token (JWT)", May 2015.
- [52] 3GPP TS 29.564: "5G System; User Plane Function Services; Stage 3".
- [53] IETF RFC 9330: "Low Latency, Low Loss, Scalable Throughput (L4S) Internet Service: Architecture", January 2023.
- [54] IETF RFC 9331: "Explicit Congestion Notification (ECN) Protocol for Very Low Queuing Delay (L4S)", January 2023.
- [55] IETF RFC 9332: "Dual-Queue Coupled Active Queue Management (AQM) for Low Latency, Low Loss, and Scalable Throughput (L4S)", January 2023.

3 Definitions of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in TR 21.905 [1], TS 26.501 [4], TS 26.506 [5] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1], TS 26.501 [4] or TS 26.506 [5].

affinity group: A set of service locations that may be physically co-located.

Media Delivery System: A deployment of a 5GMS System or RTC System.

media delivery: Delivery of media using a Media Delivery System.

media delivery session: the time interval during which media is delivered between a Media AS and one or more Media Client participants via reference point M4 at the initiation of an application (which may be a Media-aware Application) associated with each participating Media Client.

media delivery session identifier: a string that uniquely identifies a media delivery session in a Media Delivery System for the purpose of collating information from different system functions.

Media EAS: Media Application Server deployed as an Edge Application Server.

physical endpoint: A deployed instance of an Application Server service that is exposed to UEs by means of a (possibly non-unique) combination of a network layer address (e.g., IP address) and a transport layer address (e.g., TCP or UDP port number).

service location: An application layer endpoint address (e.g., URL protocol, authority and path) of a service that may be realised by multiple physical endpoints that may share the same network layer address and transport layer address.

3.2 Symbols

Void.

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
PSI	PDU Set Importance
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

4 Functions and roles

4.1 Media Application Provider

This clause is for future study.

4.2 Media AF

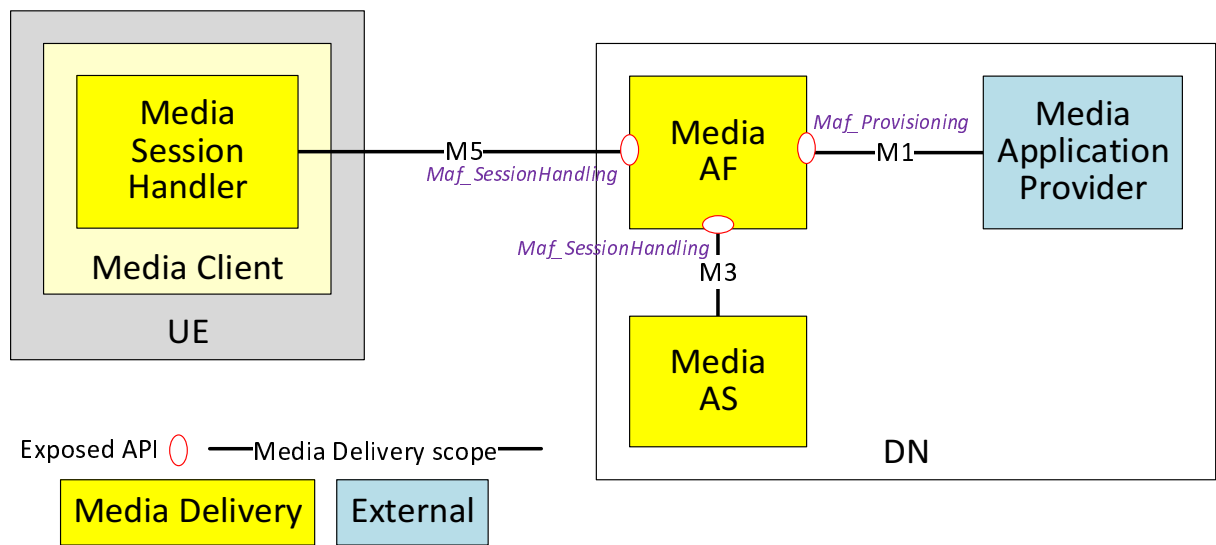


Figure 4.2-1: Services exposed by the Media AF

The Media AF shall expose the services listed in table 4.2-1 below as illustrated in figure 4.2-1 above:

Table 4.2-1: Services exposed by the Media AF

Service name	Interactions clause	API clause	Reference point	Service consumer
<i>Maf_Provisioning</i>	5.2	8	M1	Media Application Provider
<i>Maf_SessionHandling</i>	5.3	9	M3	Media AS
			M5	Media Session Handler

4.3 Media Session Handler

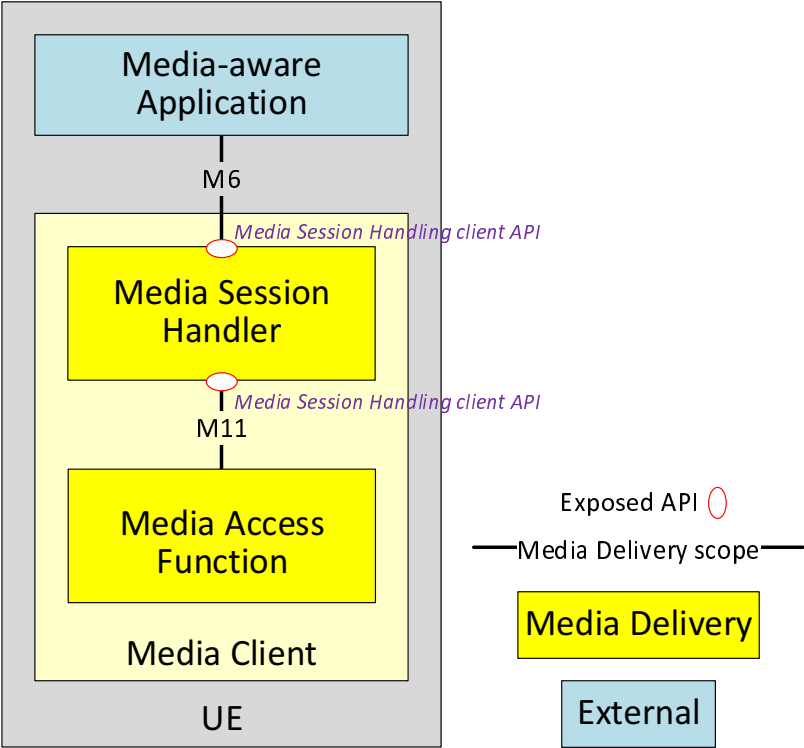


Figure 4.3-1: Services exposed by the Media Session Handler

The Media Session Handler shall expose the client APIs listed in table 4.3-1 below as illustrated in figure 4.3-1 above:

Table 4.3-1: Services exposed by the Media Session Handler

API name	Interactions clause	API clause	Reference point	API invoker
Media Session Handling client API	5.4	11	M6	Media-aware Application
			M11	Media Access Function

5 Interactions

5.1 Summary

Table 5.1-1 summarises the APIs used to provision and use the various Media Delivery features specified in TS 26.512 [6] (designated "5GMS" in the *Applicability* column) and TS 26.113 [7] (designated "RTC" in the *Applicability* column).

Table 5.1-1: Summary of APIs relevant to Media Delivery features

Media delivery feature	Abstract	Applicability	Reference point	Interactions clause	Relevant APIs	
					API name	API clause
Content hosting	Content is ingested, hosted and distributed by the Media AS according to a Content Hosting Configuration associated with a Provisioning Session. The Media AS may be instantiated in an Edge Data Network. Ingested content may additionally be distributed via eMBMS and/or MBS.	5GMS	M1	5.2.2	Provisioning Sessions API	8.2
				5.2.3	Content protocols discovery API	8.3
				5.2.4	Server Certificates provisioning API	8.4
				5.2.5	Content Preparation Templates provisioning API	8.5
				5.2.6	Edge Resources provisioning API	8.6
				5.2.7	Policy Templates provisioning API	8.7
				5.2.8	Content Hosting provisioning API	8.8
Content publishing	Content is contributed to and egested from the Media AS according to a Content Publishing Configuration associated with a Provisioning Session. The Media AS may be instantiated in an Edge Data Network.	5GMS	M1	5.3.2	Service Access Information API	9.2
				5.2.2	Provisioning Sessions API	8.2
				5.2.3	Content protocols discovery API	8.3
				5.2.4	Server Certificates provisioning API	8.4
				5.2.5	Content Preparation Templates provisioning API	8.5
				5.2.6	Edge Resources provisioning API	8.6
				5.2.7	Policy Templates provisioning API	8.7
Real-Time media Communication (RTC)	Content is exchanged in real time between RTC endpoints in the Media Client and/or the Media AS. The Media AS may be instantiated in an Edge Data Network.	RTC	M1	5.2.9	Content Publishing provisioning API	8.9
				5.3.2	Service Access Information API	9.2
				5.2.2	Provisioning Sessions API	8.2
				5.2.4	Server Certificates provisioning API	8.4
				5.2.6	Edge Resources provisioning API	8.6
				5.2.7	Policy Templates provisioning API	8.7
			M5	5.2.10	Real-time Media Communication provisioning API	8.10
				5.3.2	Service Access Information API	9.2

Dynamic Policy instantiation	The Media Client activates different traffic treatment and charging policies, including Background Data Transfer, selected from a set of Policy Templates provisioned in its Provisioning Session.	5GMS, RTC	M1	5.2.2	Provisioning Sessions API	8.3
				5.2.7	Policy Templates provisioning API	8.7
			M5	5.3.2	Service Access Information API	9.2
				5.3.3	Dynamic Policies API	9.3
Network Assistance	The Media Client requests bit rate recommendations and delivery boosts from the Media AF.	5GMS, RTC	M5	5.3.2	Service Access Information API	9.2
				5.3.4	Network Assistance API	9.4
QoE Metrics reporting	The Media Client submits metrics reports to the Media AF according to a provisioned Metrics Reporting Configuration it obtains from the Service Access Information for its Provisioning Session.	5GMS, RTC	M1	5.2.2	Provisioning Sessions API	8.3
				5.2.11	Metrics Reporting provisioning API	8.10
			M5	5.3.2	Service Access Information API	9.2
				5.3.5	Metrics Reporting API	9.5
Consumption reporting	The Media Client submits consumption reports to the Media AF about content consumed from downlink media delivery sessions according to a provisioned Consumption Reporting Configuration it obtains from the Service Access Information for its Provisioning Session.	5GMS, RTC	M1	5.2.2	Provisioning Sessions API	8.3
				5.2.12	Consumption Reporting provisioning API	8.12
			M5	5.3.2	Service Access Information API	9.2
				5.3.6	Consumption Reporting API	9.6
UE data collection, reporting and exposure	UE data related to media delivery is reported to the Data Collection AF instantiated in the Media AF for exposure to Event consumers.	5GMS	M1	5.2.13	Event Data Processing provisioning API	8.13
			M5	5.3.5	Metrics Reporting API	9.5
				5.3.6	Consumption Reporting API	9.6

5.2 Provisioning (M1) interactions

5.2.1 Overview

A Media Application Provider may use the operations in this clause to provision the different features offered by the Media Delivery System in the Media AF. The Provisioning API exposed by the Media AF to the Media Application Provider at reference point M1 offers the following sets of operations:

1. Provisioning of *Provisioning Sessions* (see clause 5.2.2) to act as an umbrella for the following provisioning information. Each such Provisioning Session is uniquely identified by a system-dependent Provisioning Session identifier as well as by system-independent service identifier that is subsequently used by an application to launch media session handling via a 3GPP Service URL (see clause 6) or used by a Media-aware Application to invoke a method on the Media Session Handler (see clause 5.4.2).
2. Discovery of the set of content ingest and/or egest protocols supported by the Media AS for a particular Provisioning Session (see clause 5.2.3):
 - For downlink media streaming according to TS 26.512 [6], discovery of the content ingest protocols available at reference point M2 and M10, and the content distribution protocols available at reference point M4 and M10.
 - For uplink media streaming according to TS 26.512 [6], discovery of the content contribution protocols available at reference point M4 and the content egest protocols available at reference point M2 and M10.
3. Provisioning of *Server Certificates* within the scope of a Provisioning Session (see clause 5.2.4) to be used by the Media AS to assert its identity to the Media Access Function in Media Clients during media delivery sessions at reference point M4.
4. Provisioning of *Content Preparation Templates* within the scope of a Provisioning Session (see clause 5.2.5) that can be used by the Media AS to manipulate media content ingested at reference point M2 or M10, or contributed at reference point M4.
5. Provisioning of *Edge Resources* within the scope of a Provisioning Session (see clause 5.2.6) to be used to instantiate the Media AS as a set of Edge Application Servers (EAS) in an Edge Data Network (EDN) using the APIs specified in TS 29.558 [15].
6. Provisioning of *Policy Templates* within the scope of a Provisioning Session (see clause 5.2.7) that can be applied to M4 downlink/uplink media delivery sessions in order to realise different Service Operation Points as part of the Dynamic Policies feature (see clause 5.3.3).
7. Provisioning of media delivery by the Media AS within the scope of a Provisioning Session using the abovementioned building blocks:
 - For downlink media streaming according to TS 26.512 [6], provisioning of the *Content Hosting* feature of the Media AS (see clause 5.2.8), which offers functionality equivalent to that of a public Content Delivery Network (CDN): content ingest at reference point M2 or M10 for onward distribution by the Media AS to Media Clients via reference point M4 or via other distribution systems such as eMBMS or MBS.

After discovering the set of ingest and distribution content protocols supported by the Media AS (see clause 5.2.3), the Media Application Provider may provision a Server Certificate (see clause 5.2.4), Content Preparation Template (see clause 5.2.5) and/or Edge Resources Configuration (see clause 5.2.6) for each Content Hosting distribution configuration to reference. The Media Application Provider may also provision one or more Policy Templates (see clause 5.2.7) to realise Service Operation Points pertaining to downlink media delivery.

- For uplink media streaming according to TS 26.512 [6], provisioning of the *Content Publishing* feature of the Media AS (see clause 5.2.9), including content contribution by Media Clients at reference point M4 and subsequent content egest of content at reference point M2 or M10 after optional manipulation by a Content Preparation Template.

After discovering the set of contribution and egest content protocols supported by the Media AS (see clause 5.2.2), the Media Application Provider may provision a Server Certificate (see clause 5.2.4), Content Preparation Template (see clause 5.2.5) and/or Edge Resources Configuration (see clause 5.2.6) for each

Content Publishing contribution configuration to reference. The Media Application Provider may also provision one or more Policy Templates (see clause 5.2.7) to realise Service Operation Points relevant to the parent Provisioning Session.

- For real-time media communication according to TS 26.113 [7], provisioning of the RTC functionality of the Media AS (see clause 5.2.10).

The Media Application Provider may provision the WebRTC Signalling Function and ICE Function (including TURN and STUN services) of the Media AS to facilitate communication between two RTC endpoints. Additionally, the Media Application Provider may provision Server Certificates (see clause 5.2.4) for presentation by these subfunctions to Media Clients. Alternatively, the Media Application Provider may provide these subfunctions itself and inform the Media AF of their endpoint addresses at the time of provisioning.

The Media Application Provider may additionally provision an Edge Resources Configuration (see clause 5.2.6) for the RTC Configuration to reference. The Media Application Provider may also provision one or more Policy Templates (see clause 5.2.7) for the RTC Configuration to reference that the Media Session Handler is then able to instantiate for RTC-based media delivery sessions.

8. Provisioning of *QoE metrics reporting* within the scope of a Provisioning Session (see clause 5.2.11) to configure how and how often the Media Client should report Quality of Experience metrics to the Media AF during the course of media delivery sessions at reference point M4.
9. Provisioning of *consumption reporting* within the scope of a Provisioning Session (see clause 5.2.12) to configure how often the Media Client should report downlink media consumption to the Media AF during the course of media delivery sessions at reference point M4.
10. Provisioning of rules for processing of UE data (see clause 5.2.13) related to media delivery sessions by the Data Collection AF instantiated in the Media AF (as defined in clause 4.7 of TS 26.501 [4]), and for restricting its exposure over reference points R5 and R6 by means of Event Data Processing Configurations and Data Access Profiles for a particular Event ID.

NOTE: The *Network Assistance* feature is not provisioned by the Media Application Provider at reference point M1. Instead, it is provisioned at the discretion of the Media Delivery System operator using means beyond the scope of the present document.

5.2.2 Provisioning Session provisioning

5.2.2.1 General

Prior to configuring media delivery features specified in subsequent clauses of the present document, the Media Application Provider shall create a new Provisioning Session resource in the Media AF at reference point M1. The Media Application Provider shall nominate a globally unique *external service identifier* that will be used by the Media Session Handler to launch media delivery sessions, and this identifier shall be associated with exactly one Provisioning Session in each Media Delivery System.

The operations specified in the following clauses are used to manage a Provisioning Session resource, as specified in clause 8.2.3.1.

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.

5.2.2.2 Enumerate Provisioning Sessions collection operation

This procedure is used by the Media Application Provider to enumerate the current set of Provisioning Sessions in the Media AF. The HTTP GET method shall be used for this purpose. The request URL shall be that of the Provisioning Sessions collection.

If the operation is successful, the Media AF shall return an HTTP 200 (OK) response. The resource body shall be a JSON array of Provisioning Session resource identifiers. The array shall contain only resource identifiers for Provisioning Sessions that the Media Application Provider is entitled to manipulate, according to the credentials

supplied with the request. This may, for example, be the subset of Provisioning Sessions tagged with the Application Server Provider identifier of the Media Application Provider. The array shall be empty if no Provisioning Sessions visible to the invoker currently exist in the collection.

5.2.2.3 Create Provisioning Session resource operation

This operation is used by the Media Application Provider to create a new Provisioning Session. The Media Application Provider shall use the HTTP POST method to create a new Provisioning Session.

Upon successful creation, the Media AF shall return a *201 (Created)* response message that includes the resource identifier of the newly created Provisioning Session resource (the *Provisioning Session identifier*) in the body of the HTTP response message and the URL of the 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 Provisioning Session resource (see clause 8.2.3.1), including any property values set by the Media AF.

If the request is acceptable but the Media AF is unable to create the Provisioning Session resource, 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 Provisioning Session resource shall remain in an uncreated state in the Media AF.

This operation may be performed multiple times by a Media Application Provider to create different Provisioning Session resources. Each such resource is assigned a different Provisioning Session identifier by the Media AF.

5.2.2.4 Retrieve Provisioning Session resource operation

This operation is used by the Media Application Provider to retrieve the current state of an existing Provisioning Session from the Media AF. The HTTP GET method shall be used for this purpose, citing the resource identifier of the target Provisioning Session in the request URL.

If the target Provisioning Session exists, the Media AF shall return an HTTP *200 (OK)* response with a representation of the Provisioning Session resource in the response message body.

5.2.2.5 Update Provisioning Session resource operation

The Update operation is not permitted for the Provisioning Sessions resource. Any attempt to do so using the HTTP PUT or PATCH methods shall result in the HTTP response *405 (Method Not Allowed)* that includes an error message body per clause 7.1.7.

To achieve an equivalent outcome, the Media Application Provider should instead destroy the existing Provisioning Session resource using the operation specified in clause 5.2.2.6 and create a new one using the operation specified in clause 5.2.2.3.

5.2.2.6 Destroy Provisioning Session resource operation

This operation is used by the Media Application Provider to destroy an existing Provisioning Session. The Media AF shall use the HTTP DELETE method for this purpose, citing the resource identifier of the target Provisioning Session in the request URL.

If the target Provisioning Session resource exists, the Media AF shall return a *204 (No Content)* HTTP response message with an empty message body. The Media AF shall release any associated resources in the Media AF and Media AS, purge any cached data, and destroy any sub-resources associated with the target Provisioning Session.

Any subsequent operations citing the resource identifier of a destroyed Provisioning Session should result in a *410 (Gone)* or else a *404 (Not Found)* HTTP response message that includes an error message body per clause 7.1.7.

5.2.3 Content protocols discovery

5.2.3.1 General

The set of downlink content ingest and/or uplink content egest protocols supported by the Media AS at reference point M2 and M10, and the set of downlink content distribution and/or uplink content contribution protocols supported by the Media AS at reference point M4 and M10 are described by the Content Protocols resource exposed by the Media AF at

reference point M1, as specified in clause 8.3.3.1. This resource shall exist in the Media AF as a sub-resource of each created Provisioning Session and may therefore be different for each one, for example to offer different content protocols depending on properties of the parent Provisioning Session or Media Application Provider.

NOTE: The information contained in the Content Protocols resource is useful to the Media Application Provider when it provides Service Access Information to the Media-aware Application at reference point M8.

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.

5.2.3.2 Create Content Protocols resource operation

The Create operation is not permitted for the Content Protocols resource. Any usage of the HTTP POST method in relation to its well-known resource URL shall result in the HTTP response *405 (Method Not Allowed)* that includes an error message body per clause 7.1.7.

5.2.3.3 Retrieve Content Protocols resource operation

This operation is used by the Media Application Provider to retrieve from the Media AF a list of downlink content ingest protocols and/or uplink content ingest protocols supported by the Media AS at reference point M2 and M10 and a list of downlink content distribution and/or uplink content contribution protocols supported by the Media AS at reference point M4 and M10. The HTTP GET method shall be used for this purpose, citing the well-known URL of the Content Protocols resource.

If the operation is successful, the Media AF shall return a *200 (OK)* response that includes a Content Protocols resource in the response message body, as specified in clause 8.3.3.1.

5.2.3.4 Update Content Protocols resource operation

The Update operation is not permitted for the Content Protocols resource. Any usage of the HTTP PUT or PATCH methods in relation to its well-known resource URL shall result in the HTTP response *405 (Method Not Allowed)* that includes an error message body per clause 7.1.7.

5.2.3.5 Destroy Content Protocols resource operation

The Destroy operation is not permitted for the Content Protocols resource. Any usage of the HTTP DELETE method in relation to its well-known resource URL shall result in the HTTP response *405 (Method Not Allowed)* that includes an error message body per clause 7.1.7.

5.2.4 Server Certificate provisioning

5.2.4.1 General

Each X.509 server certificate [10] presented by the Media AS to the Media Client at reference point M4 is represented by a Server Certificate resource at reference point M1. The Server Certificates Provisioning API specified in clause 8.4 enables a Server Certificate resource to be created within the scope of a Provisioning Session, and subsequently referenced by a Content Hosting Configuration or Content Publishing Configuration or RTC Configuration created in the scope of the same Provisioning Session. That API supports two alternative provisioning methods for Server Certificate resources: one in which a certificate is generated by the Media Delivery System operator on behalf of the Media Application Provider; the other in which a certificate is generated by the Media Application Provider from a Certificate Signing Request solicited from the Media AF. Both methods shall be supported by implementations of the Media AF.

Under no circumstances shall the Media AF reveal the private key associated with a Certificate Signing Request to the Media Application Provider.

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.

5.2.4.2 Create Server Certificate resource operation

This operation is used by the Media Application Provider to request that the Media Delivery System generates a new X.509 certificate [10] on its behalf within the scope of a Provisioning Session. In this case, the certificate's Common Name (*CN*) and a single Subject Alternative Name (*subjectAltName*, see section 4.2.1.6 of RFC 5280 [11]) is assigned in a domain under the control of the Media Delivery System operator and the use of supplementary domain name aliases is not supported. The first Subject Alternative Name (*subjectAltName*) extension field of the certificate should be identical to its Common Name. Both fields may include a single wildcard ("*") character at the start to indicate applicability to several different subdomains of the same domain.

NOTE 1: Modern TLS client implementations ignore the obsolete Common Name (*CN*) field of the X.509 certificate in favour of the first Subject Alternative Name (*subjectAltName*) extension field.

The Media Application Provider shall use the HTTP POST method to create a new Server Certificate resource in the Media AF. The request URL shall be a well-known sub-resource of the Provisioning Session resource representing its Server Certificates resource collection, as specified in clause 8.4.2. The HTTP request message body shall be omitted.

Upon successful creation, the Media AF shall return a 201 (*Created*) HTTP response message and the URL of the newly created Server Certificate resource, including its resource identifier, shall be provided in the HTTP Location header field. The response message body may optionally convey a copy of the X.509 certificate corresponding to the newly created Server Certificate resource, as specified in clause 8.4.3.2.

NOTE 2: The X.509 certificate corresponding to the newly created Server Certificate resource may not be available immediately for interrogation and use. See clause 5.2.4.5 below for more details.

If the request is acceptable but the Media AF is unable to provision the X.509 certificate, 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 Server Certificate resource shall remain in an uncreated state in the Media AF.

This operation may be performed multiple times by a Media Application Provider to provision different Server Certificate resources within the scope of a Provisioning Session. Each such resource is assigned a different Server Certificate resource identifier by the Media AF.

5.2.4.3 Reserve Server Certificate resource operation

This operation is used by the Media Application Provider to solicit a Certificate Signing Request (CSR) from the Media AF for the purpose of generating an X.509 certificate [10] independently of the Media Delivery System. In this case, the certificate's Common Name (*CN*) is assigned in a domain under the control of the Media Application Provider itself, or that of a third party acting on its behalf. The first Subject Alternative Name (*subjectAltName*) extension field of the certificate should be identical to its Common Name. The *CN* and *subjectAltName* fields may include a single wildcard ("*") character at the start to indicate applicability to several different subdomains of the same domain.

NOTE: Modern TLS client implementations ignore the obsolete Common Name (*CN*) field of the X.509 certificate in favour of the first Subject Alternative Name (*subjectAltName*) extension field.

The Media Application Provider may specify additional domains in its certificate reservation request to the Media AF. If provided, these domain name aliases shall be included in the returned Certificate Signing Request using the Subject Alternative Name (*subjectAltName*) extension (see section 4.2.1.6 of RFC 5280 [11]). In this case, the Media Application Provider is responsible for ensuring that any FQDN aliases it subsequently provisions in Content Hosting Configurations or Content Publishing Configurations matching these additional domains resolve to the canonical domain name of the Media AS in the target Media Application System.

The Media Application Provider shall separately arrange for the FQDN carried in the Common Name of the certificate generated, or those of all Subject Alternative Name (*subjectAltName*) extensions in the same certificate (see section 4.2.1.6 of RFC 5280 [11]), to resolve to the address of a Media AS in the target Media Delivery System after provisioning the Content Hosting feature per clause 5.2.8.2 or the Content Publishing feature per clause 5.2.9.2.

The Media Application Provider shall use the HTTP POST method to create a new Server Certificate. The request URL shall be a well-known sub-resource of the Provisioning Session resource representing its Server Certificates resource collection, as specified in clause 8.4.2, including the query parameter specified there. Domain name aliases (if any) shall be conveyed in the HTTP request message body, encoded as a JSON [37] array of strings; otherwise, the request message body shall be omitted. Upon successful creation of the resource, the Media AF shall return a 201 (*Created*) response message and the URL of the resource, including the resource identifier of the reserved Server Certificate

resource, shall be returned in the HTTP Location header. The HTTP response message shall provide a Certificate Signing Request as specified in clause 8.4.3.1.

If the list of additional domains in the HTTP request message is malformed, the Media AF shall return a *400 (Bad Request)* response message.

If the request is acceptable but the Media AF is unable to generate a Certificate Signing Request, the creation 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 Server Certificate resource shall remain in an uncreated state in the Media AF.

This operation may be performed multiple times by a Media Application Provider to provision different Server Certificate resources within the scope of a Provisioning Session. Each such resource is assigned a different Server Certificate resource identifier by the Media AF.

5.2.4.4 Upload Server Certificate resource operation

This operation is used by a Media Application Provider to upload an X.509 certificate [10] to the Media AF that it has generated in response to a Certificate Signing Request solicited using the reservation operation specified in clause 5.2.4.3 above. The Media Application Provider shall use the HTTP PUT method for this purpose. The Content-Type request header and the body of the HTTP request message shall be as specified in clause 8.4.3.2.

The Media AF shall verify that the party originating the upload is the same party that reserved the Server Certificate resource using the operations specified in clause 5.2.4.3 above before accepting the supplied X.509 certificate. The Media AF shall also verify that the X.509 certificate uploaded corresponds to the Certificate Signing Request it issued for the Server Certificate resource in question. If there is a mismatch, the HTTP response *403 (Forbidden)* shall be returned.

Attempting to upload an X.509 certificate to a Server Certificate resource URL that has not been reserved using the operation specified in clause 5.2.4.3 above shall elicit a *404 (Not Found)* HTTP response.

On success, the HTTP response *204 (No Content)* shall be returned with an empty response body.

5.2.4.5 Retrieve Server Certificate resource operation

This operation is used by the Media Application Provider to download a Server Certificate resource from the Media AF for inspection. The HTTP GET method shall be used for this purpose, citing the resource identifier of the target Server Certificate in the request URL.

If the requested resource exists and is populated with an X.509 certificate [10], the Media AF shall return *200 (OK)* HTTP response message with a representation of the target Server Certificate in the response message body in accordance with clause 8.4.3.2.

In the case where the X.509 certificate was provisioned by the Media Delivery System on behalf of the Media Application Provider according to clause 5.2.4.2 above, the HTTP response *204 (No Content)* shall be returned until such time as the X.509 certificate is generated and available for download. The optional HTTP response header *Retry-After* should be included in such a response, indicating when the certificate is expected to become available for inspection and use.

In cases where the X.509 certificate is to be generated by the Media Application Provider from a Certificate Signing Request obtained according to clause 5.2.4.3 above, the HTTP response *204 (No Content)* shall be returned with an empty message response body until such time as the X.509 certificate has been uploaded using the operation specified in clause 5.2.4.4 above.

5.2.4.6 Update Server Certificate resource operation

The Update operation is not permitted for the Server Certificate resource. Any attempt to do so using the HTTP PUT method shall result in the HTTP response *405 (Method Not Allowed)* that includes an error message body per clause 7.1.7.

Updating a previously uploaded Server Certificate in the Media AF is not permitted for security reasons. To supply a replacement X.509 certificate, for example when a previously supplied certificate is shortly due to expire, the Media Application Provider should instead use one of the operations specified in clause 5.2.4.2 or 5.2.4.3 above to create or

reserve a new Server Certificate resource and, once the certificate is available for use, update the Content Hosting Configuration to reference it.

5.2.4.7 Destroy Server Certificate resource operation

This operation is used by the Media Application Provider to remove a Server Certificate resource from a Provisioning Session in the Media AF. The HTTP DELETE method shall be used for this purpose, citing the resource identifier of the target Server Certificate in the request URL.

On success, the HTTP response *204 (No Content)* shall be returned with an empty response body and afterwards the identifier of the Service Certificate resource is no longer valid. The party that originally created (see clause 5.2.4.2) or reserved (see clause 5.2.4.3) the Server Certificate resource is responsible for ensuring that the serial number of the destroyed certificate is appropriately revoked. Only the party that created (see clause 5.2.4.2) or reserved (see clause 5.2.4.3) the Server Certificate resource is permitted to destroy it. Any attempt by another party to destroy a Server Certificate resource shall elicit the HTTP response *405 (Method Not Allowed)*.

The HTTP response *409 (Conflict)* shall be returned with an error message body per clause 7.1.7 if an attempt is made to destroy a Server Certificate resource that is currently referenced by a Content Hosting Configuration or Content Publishing Configuration resource.

Attempting to destroy a Server Certificate resource that has been reserved but never uploaded shall elicit a *200 (OK)* HTTP response with an empty message body. In this case, the Media AF should release any resources associated with the reservation.

Any subsequent operations citing the resource identifier of a destroyed Server Certificate should result in a *410 (Gone)* or else a *404 (Not Found)* HTTP response message that includes an error message body per clause 7.1.7.

5.2.5 Content Preparation provisioning

5.2.5.1 General

For downlink media delivery, the Media AS may be required to process content ingested at reference point M2 or M10 before distributing it at reference point M4 or M10. For uplink media delivery, the Media AS may be required to process content contributed by Media Clients before publishing it to the Media Application Provider at reference point M2 or M10. These content processing operations are described by a Content Preparation Template resource provisioned in the Media AF by the Media Application Provider at reference point M1, as specified in clause 8.5, and subsequently configured in the Media AS by the Media AF at reference point M3 using an API outside the scope of the present document.

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.

5.2.5.2 Create Content Preparation Template resource operation

This operation is used by the Media Application Provider to register a new Content Preparation Template with a Provisioning Session in the Media AF. The Media Application Provider shall use the HTTP POST method to upload a new Content Preparation Template resource to the Media AF. The request URL shall be a well-known sub-resource of the Provisioning Session resource representing its Content Preparation Templates resource collection, as specified in clause 8.5.2. The HTTP request message body shall be a Content Preparation Template as specified in clause 8.5.3. The MIME content type of the Content Preparation Template shall be supplied in the **Content-Type** HTTP request header.

Upon successful creation, the Media AF shall respond with a *201 (Created)* response message and the URL of the newly created 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 Content Preparation Template resource (see clause 8.5.3), including any properties assigned by the Media AF.

This operation may be performed multiple times by a Media Application Provider to provision different Content Preparation Template resources within the scope of a Provisioning Session. Each such resource is assigned a different Content Preparation Template identifier by the Media AF.

If the MIME content type indicated in **Content-Type** is not understood by the Media AF, the creation of the Content Preparation Template resource shall fail with HTTP error response status code **415 (Unsupported Media Type)** that includes an error message body per clause 7.1.7.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Content Preparation Template, 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 Content Preparation Template resource shall remain in an uncreated state in the Media AF.

5.2.5.3 Retrieve Content Preparation Template resource operation

This operation is used by the Media Application Provider to retrieve the current state of a Content Preparation Template resource from the Media AF. The HTTP GET method shall be used for this purpose, citing the resource identifier of the target Content Preparation Template in the request URL.

If the operation is successful, the Media AF shall respond with **200 (OK)** and shall provide a representation of the requested resource in the HTTP message response body. The **Content-Type** response header shall have the same value as that supplied when the Content Preparation Template resource was created using the operation specified in clause 5.2.5.2.

5.2.5.4 Update Content Preparation Template resource operation

This operation is used by the Media Application Provider to modify or replace an existing Content Preparation Template resource. The HTTP PATCH or HTTP PUT methods shall be used for this purpose. The replacement Content Preparation Template resource representation shall be provided in the body of the HTTP request message.

If the HTTP request is acceptable but the operation results in no change to the resource representation, a **204 (No Content)** HTTP response message with an empty body should be returned.

If the operation is otherwise successful, the Media AF shall return a **200 (OK)** HTTP response message and shall provide a representation of the current state of the resource in the message body to confirm successful update.

If the Media AF does not support modification of the Content Preparation Template, the update operation shall fail with a **403 (Forbidden)** HTTP response that includes an error message body per clause 7.1.7.

If the MIME content type indicated in **Content-Type** is not acceptable to the Media AF, the update of the Content Preparation Template resource shall fail with HTTP error response status code **415 (Unsupported Media Type)**.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Content Preparation Template, the update 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 Content Preparation Template resource in the Media AF shall remain in the state immediately prior to the update operation.

5.2.5.5 Destroy Content Preparation Template resource operation

This operation is used by the Media Application Provider to destroy a Content Preparation Template resource. The HTTP DELETE method shall be used for this purpose, citing the resource identifier of the target Content Preparation Template in the request URL.

If the operation is successful, the Media AF shall return a **204 (No Content)** response message with an empty message body.

If the Content Preparation Template is still referenced by a Content Hosting Configuration or Content Publishing Configuration, the operation shall fail with HTTP error response status code **409 (Conflict)** that includes an error message body per clause 7.1.7.

5.2.6 Edge Resources provisioning

5.2.6.1 General

These operations are used by the Media Application Provider at reference point M1 to provision edge computing resources in the Media AF for the purpose of instantiating Edge Application Server (EAS) instances of the Media AS in an Edge Data Network (EDN), as defined in TS 23.558 [13].

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.

5.2.6.2 Create Edge Resources Configuration resource operation

This operation is used by the Media Application Provider to create a new Edge Resources Configuration resource in the Media AF. The HTTP POST method shall be used for this purpose. The request URL shall be a well-known sub-resource of the Provisioning Session resource representing its Edge Resources Configurations resource collection, as specified in clause 8.6.2. The request message body shall be an Edge Resources Configuration resource representation, as specified in clause 8.6.3.1.

- If the *edgeManagementMode* is set to *EM_AF_DRIVEN* (indicating AF-driven edge resource management), the Media AF is responsible for requesting and managing the required edge resources and for handling EAS relocation in relation to media delivery sessions that fall within the scope of the parent Provisioning Session.
- If the *edgeManagementMode* is set to *EM_CLIENT_DRIVEN* (indicating client-driven edge resource management), the Media AF shall only request edge resources based on requests from the Edge Enabler Client (EEC) instantiated in the Media Session Handler at reference point EDGE-1 (as defined in clause 6 of TS 23.558 [13]).

If the operation is successful, the Media AF shall generate a resource identifier representing the new Edge Resources Provisioning Configuration. In this case, the Media AF shall respond with a *201 (Created)* HTTP response message and the URL of the newly created 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 Edge Resources Configuration resource (see clause 8.6.3.1), including any properties assigned by the Media AF.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Edge Resources Configuration, 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 Edge Resources Configuration resource shall remain in an uncreated state in the Media AF.

This operation may be performed multiple times by a Media Application Provider to provision different Edge Resources Configuration resources within the scope of a Provisioning Session. Each such resource is assigned a different Edge Resources Configuration identifier by the Media AF.

5.3.6.3 Retrieve Edge Resources Configuration resource operation

This operation is used by the Media Application Provider to retrieve the current state of an existing Edge Resources Provisioning Configuration resource from the Media AF. The HTTP GET method shall be used for this purpose.

If the procedure is successful, the Media AF shall return a *200 (OK)* response message that includes a representation of the target Edge Resources Configuration resource (see clause 8.6.3.1) in the response message body.

5.2.6.4 Update Edge Resources Configuration resource operation

This operation is invoked by the Media Application Provider to modify the properties of an existing Edge Resources Configuration resource. All writeable properties except *edgeManagementMode* may be updated. The HTTP PATCH or HTTP PUT methods shall be used for this purpose. The replacement Edge Resources Configuration resource representation shall be provided in the body of the HTTP request message.

If the HTTP request is acceptable but the operation results in no change to the resource representation, a *204 (No Content)* HTTP response message with an empty body should be returned.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* HTTP response message and shall provide a representation of the resulting state of the resource in the message body to confirm successful update.

Attempts to modify read-only properties of the target Edge Resources Configuration resource, such as the edge management mode, shall be rejected by the Media AF with a *403 (Forbidden)* HTTP response that includes an error message body per clause 7.1.7.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Edge Resources Configuration, the update 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 Edge Resources Configuration resource in the Media AF shall remain in the state immediately prior to the update operation.

5.2.6.5 Destroy Edge Resources Configuration resource operation

This operation is used by the Media Application Provider to destroy an Edge Resources Configuration resource in the Media AF. The HTTP DELETE method shall be used for this purpose, citing the resource identifier of the target Edge Resources Configuration in the request URL. This operation makes the configuration unusable for future media delivery sessions, but it does not affect any ongoing media delivery sessions.

If the operation is successful, the Media AF shall return a *204 (No Content)* HTTP response message with an empty message body.

The HTTP response *409 (Conflict)* shall be returned with an error message body per clause 7.1.7 if an attempt is made to destroy an Edge Resources Configuration resource that is currently referenced by a Content Hosting Configuration or Content Publishing Configuration resource.

Any subsequent operations citing the resource identifier of a destroyed Edge Resources Configuration should result in a *410 (Gone)* or else a *404 (Not Found)* HTTP response message that includes an error message body per clause 7.1.7.

5.2.7 Dynamic Policy provisioning

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 specific Data Network(s) and/or network slice(s) at reference point M4, the *applicationSessionContext* array shall be present with at least one of the following properties populated in each member of the array:

- 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.

Multiple Network Slice and/or Data Network tuples may be provisioned if the Policy Template allows media to be delivered in multiple Data Networks and/or network slices at reference point M4.

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 *PolicyConstraints* (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 *PolicyConstraints* object 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.

- The *downlinkDataBurstSizeMarkingRequired* flag is used to specify whether the Media AS is required to apply data burst size marking to downlink PDUs falling within the scope of a Dynamic Policy Instance based on this Policy Template.
- The *downlinkTimeToNextBurstMarkingRequired* flag is used to specify whether the Media AS is required to apply time to next burst marking to downlink PDUs falling within the scope of a Dynamic Policy Instance based on this Policy Template.
- The *downlinkExpeditedTransferIndicationMarkingRequired* flag is used to specify whether the Dynamic Policy invoker (Media Client or the Media AS) is allowed to configure different QoS requirements for expedited and non-expedited PDU delivery, and whether the Media AS is required to apply expedited transfer indication marking to downlink PDUs falling within the scope of a Dynamic Policy Instance based on this Policy Template.

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 *numberOfUses* 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 [53], RFC 9331 [54] and RFC 9332 [55], 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.

5.2.7.2 Policy Template life-cycle

The state of a Policy Template is exposed by the Media AF in the *state* property of the Policy Template resource and has one of the values specified in table 5.2.7.2-1.

Table 5.2.7.2-1: Policy Template states

Policy Template state	Meaning
<i>PENDING</i>	The Policy Template is awaiting validation by the Media Delivery System, potentially because not all required parameters have yet been provided. This is the default state after Policy Template creation.
<i>INVALID</i>	One or more of the Policy Template's properties failed validation by the Media Delivery System.
<i>READY</i>	After successful validation by the Media Delivery System the Policy Template moves into this state.
<i>SUSPENDED</i>	The Media Delivery System may move a Policy Template into this state under certain conditions defined within the Service Level Agreement.

Figure 5.2.7.2-1 below is a state diagram showing the life-cycle of a Policy Template resource in the Media AF.

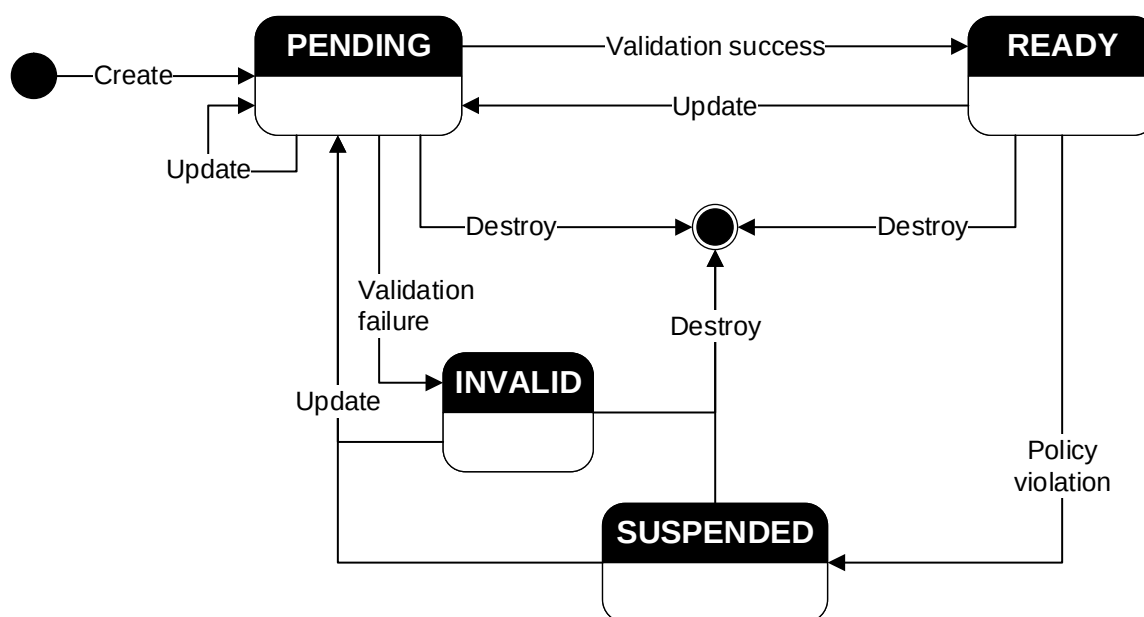


Figure 5.2.7.2-1: Policy Template Resource State Diagram

Policy Templates require Media Delivery System operator verification, and a Policy Template resource that is newly created cannot be used immediately.

1. Upon creation, a Policy Template resource shall be in the *PENDING* state. Once all mandatory properties are provided, the Media AF triggers validation.
2. If the Policy Template is not deemed to be valid by the operator of the Media Delivery System, it shall move to the *INVALID* state, from where it can be updated to remedy the defect.
3. Once it has been successfully validated by the Media Delivery System operator, a Policy Template resource shall take the *READY* state, indicating that it may be applied to media delivery sessions.
4. If it is subsequently updated by the Media Application Provider, a Policy Template resource shall return to the *PENDING* state, awaiting revalidation by the operator of the Media Delivery System.
5. Finally, a Policy Template resource may be *SUSPENDED* by the Media Delivery System operator, e.g., in case of a violation of the usage terms or for some other reasons, which renders it unusable. The update of any property moves the state from *SUSPENDED* into *PENDING* and triggers revalidation.

A Policy Template resource may be destroyed when it is in any of the abovementioned states.

The Media AF shall verify the status of a Policy Template resource prior to allowing a Dynamic Policy Instance to instantiate it. Only a Policy Template resource in the *READY* state is eligible to be instantiated in this way.

The Media AF shall indicate the current state of a Policy Template in the Policy Template resource in machine-readable form as well as indicating a human-readable reason for this state.

5.2.7.3 Create Policy Template resource operation

This operation is used by the Media Application Provider to create a new Policy Template resource. The HTTP POST method shall be used for this purpose. The request URL shall be a well-known sub-resource of the Provisioning Session resource representing its Policy Templates resource collection, as specified in clause 8.7.2. The HTTP request message body shall be a Policy Template resource representation, as specified in clause 8.7.3.1.

If the Policy Template includes the *bdtSpecification* property, the Media AF shall attempt to create a series of new Background Data Transfer policies in the PCF using the procedure specified in clause 5.5.2. The individual Background Data Transfer policy associated with each time window shall be created prior to the start of that time window.

If the procedure is successful, the Media AF shall generate a resource identifier to uniquely identify the newly created Policy Template resource. In that case, it shall return a *201 (Created)* HTTP response message and the URL of the newly created 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 Policy Template resource (see clause 8.7.3.1), including any property values set by the Media AF.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Policy Template (for example if it fails to create a new Background Data Transfer policy), 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 Policy Template resource shall remain in an uncreated state in the Media AF.

This operation may be performed multiple times by a Media Application Provider to provision different Policy Template resources within the scope of a Provisioning Session. Each such resource is assigned a different Policy Template identifier by the Media AF.

The default state of a newly created Policy Template resource is *PENDING*. If all mandatory property values have been provided, the Policy Template resource is eligible for validation, as specified in clause 5.2.7.2.

5.2.7.4 Retrieve Policy Template resource operation

This operation is used by the Media Application Provider to retrieve the current state of an existing Policy Template resource in the Media AF. The HTTP GET method shall be used for this purpose, citing the resource identifier of the target Policy Template in the request URL.

If the operation is successful, the Media AF shall return a *200 (OK)* response that includes a representation of the target Policy Template resource (see clause 8.7.3.1) in the response message body.

5.2.7.5 Update Policy Template resource operation

This operation is invoked by the Media Application Provider to modify the properties of an existing Policy Template resource in the Media AF. All available properties except *state* may be updated. The HTTP PATCH or HTTP PUT methods shall be used for this purpose. The replacement Policy Template resource representation shall be provided in the body of the HTTP request message.

Any update to the Policy Template resource shall automatically change its state back to *PENDING*, which makes it temporarily unusable by ongoing media delivery sessions. Accordingly, any attempt to instantiate the Policy Template (see clause 5.4.3) shall fail. If all mandatory property values have been provided by the Media Application Provider, the updated Policy Template is eligible for revalidation.

If the HTTP request is acceptable but the operation results in no change to the resource representation, a *204 (No Content)* HTTP response message with an empty body should be returned.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* response message that includes a representation of the target Policy Template resource in the response message body, confirming successful update.

Attempts to modify read-only properties of the target Policy Template resource, such as its state, shall be rejected by the Media AF with a *403 (Forbidden)* HTTP response that includes an error message body per clause 7.1.7.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Policy Template, the update 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 Policy Template resource in the Media AF shall remain in the state immediately prior to the update operation.

5.2.7.6 Destroy Policy Template resource operation

This operation is used by the Media Application Provider to destroy a Policy Template resource in the Media AF. The HTTP DELETE method shall be used for this purpose, citing the resource identifier of the target Policy Template in the request URL.

If the operation is successful, the Media AF shall return a *204 (No Content)* response message with an empty message body.

All currently active media delivery sessions using the destroyed Policy Template shall revert to a default network QoS as a result of destroying the Policy Template resource.

Any subsequent operations citing the resource identifier of a destroyed Policy Template should result in a *410 (Gone)* or else a *404 (Not Found)* HTTP response message that includes an error message body per clause 7.1.7.

5.2.8 Content Hosting provisioning

5.2.8.1 General

These operations are used by the Media Application Provider at reference point M1 to provision the Content Hosting feature for downlink media delivery.

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.

5.2.8.2 Create Content Hosting Configuration resource operation

This operation is used by the Media Application Provider at reference point M1 to activate the Content Hosting feature for a particular Provisioning Session. The Media Application Provider shall use the HTTP POST method for this purpose. The request URL shall be a well-known sub-resource of the Provisioning Session resource, as specified in clause 8.8.2. The HTTP request message body shall be a Content Hosting Configuration resource representation, as specified in clause 8.8.3.1. There is at most one Content Hosting Configuration at a time for a given Provisioning Session.

Regarding the configuration of content ingest by the Media AS from the Media Application Provider at reference point M2 or from another MediaAS at reference point M10:

- If the Content Hosting Configuration uses the pull-based content ingest method, i.e., the *IngestConfiguration.mode* attribute is set to *PULL*, then the *IngestConfiguration.baseURL* property shall be nominated by the Media Application Provider in the request message body. The Media AF shall return the *IngestConfiguration.baseURL* property value unchanged in its response message body.
- If the Content Hosting Configuration uses the push-based content ingest method, i.e., the *IngestConfiguration.mode* attribute is set to *PUSH*, then the *IngestConfiguration.baseURL* property shall be nominated by the Media AF and returned in the response message body. It shall not be set by the Media Application Provider in the request message body.

Regarding the configuration(s) of content distribution by the Media AS to the Media Client from reference point M4 service locations or to another Media AS from reference point M10 service locations:

- The Media Application Provider defines one or more distribution configurations in the *distributionConfigurations* array within a Content Hosting Configuration to distribute content via the Media AS. When more than one content distribution configuration is provided in the HTTP request message body, the operation to create the Content Hosting Configuration resource shall be successful if and only if all such distribution configurations are acceptable to the Media AF.
- As a side-effect of provisioning, the Media AF associates a Media AS service location exposed at reference point M4 or M10 with every distribution. A service location may be associated with one or more physical endpoints at the discretion of the Media AF, subject to guidance from the Media Application Provider as described below.

NOTE: When HTTP [24] is used as the media delivery protocol at reference point M4 or M10, a service location is distinguished by a unique combination of protocol, authority (host name and port) and base path. The same service location may be associated with different physical endpoints using techniques such as anycast IP routing or DNS round-robin resolution.

- Every distribution configuration shall be assigned an identification label by the Media Application Provider, unique within the scope of the parent Content Hosting Configuration, in the *DistributionConfiguration.distributionId* property. This identification label may be referenced from other resources in the Provisioning Session, such as a Content Preparation Template (see clause 5.2.5).

- A distribution configuration may be configured to distribute content at either reference point M4 or M10. In all cases where the distribution configuration is configured to distribute content at reference point M4, the *DistributionConfiguration.mode* shall be set to *PULL*.
- The Media Application Provider may use the *DistributionConfiguration.affinityGroup* property to indicate to the Media AF that the physical endpoint(s) realising the Media AS service location associated with a distribution configuration may or may not be co-located with those of another service location associated with another distribution configuration defined in the same Content Hosting Configuration. The physical endpoint(s) of Media AS service locations associated with distribution configurations declaring different *DistributionConfiguration.affinityGroup* values shall not be co-located.
- In all cases, the *DistributionConfiguration.canonicalDomainName* property is read-only at reference point M1: it shall always be omitted from the creation request and shall be assigned by the Media AF, allowing its value to be inspected by the Media Application Provider in the returned Content Hosting Configuration resource representation, or by using the operation specified in clause 5.2.8.3 below.
- The *DistributionConfiguration.baseURL* property is:
 - Read-only at reference point M1 in all cases where *DistributionConfiguration.mode* is set to *PULL*. The *DistributionConfiguration.baseURL* shall always be omitted from the creation request and shall be assigned by the Media AF, allowing its value to be inspected by the Media Application Provider in the returned Content Hosting Configuration resource representation, or by using the operation specified in clause 5.2.8.3 below.
 - Assigned by the Media Application Provider in all cases where *DistributionConfiguration.mode* is set to *PUSH*. The Media AF shall return the Media AS *DistributionConfiguration.baseURL* property value unchanged in its response message body.
- If the *DistributionConfiguration.certificateId* property is present and valid, the Media AF shall assign a canonical domain name for the Media AS to expose at reference point M4 service locations that matches the Common Name and the first Subject Alternative Name in the referenced Server Certificate resource (taking into account wildcard matching) regardless of whether the corresponding X.509 certificate was created using the operation specified in clause 5.2.4.2 or those specified in clauses 5.2.4.3 and 5.2.4.4.
- The Media Application Provider may nominate an alternative domain name to be advertised to the Media Client in the Service Access Information by setting the *DistributionConfiguration.domainNameAlias* property when (and only when) creating the Content Hosting Configuration resource. If valid, the value of this property shall then appear in the *DistributionConfiguration.baseURL* assigned by the Media AF instead of *DistributionConfiguration.canonicalDomainName*. The Media Application Provider shall ensure that this domain name alias resolves to the canonical domain name of the Media AS notified by the Media AF in its response by means of suitable DNS configuration.
- If the *DistributionConfiguration.entryPoint* property is present and valid, the Media Entry Point applies to all content distributed from the Media AS service location associated with the distribution configuration in question. Additionally:
 - The *RelativeMediaEntryPoint.relativePath* property shall point to a Media Entry Point resource.
 - The *RelativeMediaEntryPoint.contentType* property shall indicate the MIME content type of the Media Entry Point.
 - The *RelativeMediaEntryPoint.profiles* array may optionally specify a list of conformance profile URIs associated with the Media Entry Point, where a profile may indicate an interoperability point, for example.

A Media Entry Point resource may additionally include configuration for the purposes of accessing the content from multiple service locations either hosted by the Media AS (i.e., available via reference point M4) or by the Media Application Provider (i.e., available via reference point M13).

When the pull-based content ingest is by a downstream Media AS from an upstream Media AS via reference point M10, the following applies in addition:

- The upstream Media AS Content Hosting Configuration shall be provisioned first. It may use either the pull-based content ingest method, i.e., the *IngestConfiguration.mode* attribute is set to *PULL*, or the push-based content ingest method, i.e., the *IngestConfiguration.mode* attribute is set to *PUSH*.

- The *DistributionConfiguration.mode* for the distribution configuration defined in the upstream Media AS Content Hosting Configuration that is intended to serve the downstream Media AS at reference point M10 shall be set to *PULL*.
- The downstream Media AS Content Hosting Configuration shall be provisioned after the upstream Media AS using the pull-based content ingest method, i.e., the *IngestConfiguration.mode* property shall be set to *PULL*.
- The *IngestConfiguration.baseURL* property of the downstream Media AS Content Hosting Configuration shall be set by the Media Application Provider in the request message body to be the same value as the *DistributionConfiguration.baseURL* of the distribution of the upstream Media AS Content Hosting Configuration intended to serve the downstream Media AS at reference point M10.

When the push-based content ingest is by a downstream Media AS from an upstream Media AS at reference point M10, the following applies in addition:

- The downstream Media AS Content Hosting Configuration shall be provisioned first using the push-based content ingest method, i.e., the *IngestConfiguration.mode* property shall be set to *PUSH*.
- The upstream Media AS Content Hosting Configuration shall be provisioned after the downstream Media AS. It shall use the push-based content ingest method, i.e., the *IngestConfiguration.mode* attribute is set to *PUSH*, and it shall contain at least one distribution intended to serve the downstream Media AS at reference point M10. This distribution configuration shall use the push-based content distribution method, i.e., the *DistributionConfiguration.mode* shall be set to *PUSH*.
- The *DistributionConfiguration.baseURL* property of the upstream Media AS Content Hosting Configuration for the distribution intended to serve the downstream Media AS shall be set by the Media Application Provider to be the same values as the *IngestConfiguration.baseURL* of the downstream Media AS Content Hosting Configuration that was nominated by the Media AF and returned in the response message body when the Content Hosting Configuration of the downstream Media AS was provisioned.

If the operation is successful, the Media AF shall return a *201 (Created)* HTTP response message, and the request URL shall be returned as the value of the *Location* HTTP header field. The response message body shall be a representation of the current state of the Content Hosting Configuration resource (see clause 8.8.3.1), including any properties assigned by the Media AF.

If any resources referenced by the supplied Content Hosting Configuration resource representation are invalid, 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 Content Hosting Configuration resource shall remain in an uncreated state in the Media AF.

If *DistributionConfiguration.domainNameAlias* is set in the supplied Content Hosting Configuration resource representation but its value is not a syntactically valid Fully-Qualified Domain Name or if the *DistributionConfiguration.certificateId* property is absent or if the supplied domain name alias does match any of one of the Subject Alternative Names listed in the Server Certificate referenced by the *DistributionConfiguration.certificateId* property, 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 Content Hosting Configuration resource shall remain in an uncreated state in the Media AF.

NOTE: Even if multiple distribution configurations in the same Content Hosting Configuration reference the same Server Certificate resource, they may each nominate a different domain name alias from among its Subject Alternative Names.

Attempting to create a Content Hosting Configuration in the scope of a Provisioning Session of any type other than *MS_DOWNLINK* 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 Content Hosting Configuration resource shall remain in an uncreated state in the Media AF.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Content Hosting Configuration, 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 Content Hosting Configuration resource shall remain in an uncreated state in the Media AF.

5.2.8.3 Retrieve Content Hosting Configuration resource operation

This operation is used by the Media Application Provider to retrieve the current state of an existing Content Hosting Configuration resource from the Media AF. The HTTP GET method shall be used for this purpose.

If the operation is successful, the Media AF shall return a *200 (OK)* response message that includes a representation of the target Content Hosting Configuration resource (see clause 8.8.3.1) in the response message body.

5.2.8.4 Update Content Hosting Configuration resource operation

This operation is invoked by the Media Application Provider to modify the properties of an existing Content Hosting Configuration resource. All writeable properties except *domainNameAlias* may be updated. The HTTP PATCH or HTTP PUT methods shall be used for this purpose. The replacement Content Hosting Configuration resource representation shall be provided in the body of the HTTP request message.

If the HTTP request is acceptable but the operation results in no change to the resource representation, a *204 (No Content)* HTTP response message with an empty body should be returned.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* HTTP response message and shall provide a representation of the current state of the target resource in the message body to confirm successful update.

If any resources referenced by the supplied Content Hosting Configuration resource representation are invalid, 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 Content Hosting Configuration resource shall remain in the state immediately prior to the update operation.

Attempts to modify read-only properties of the target Content Hosting Configuration resource, such as the canonical domain name of a distribution configuration, shall be rejected by the Media AF with a *403 (Forbidden)* HTTP response that includes an error message body per clause 7.1.7.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Content Hosting Configuration, the update 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 Content Hosting Configuration resource in the Media AF shall remain in the state immediately prior to the update operation.

5.2.8.5 Destroy Content Hosting Configuration resource operation

This operation is used by the Media Application Provider to destroy a Content Hosting Configuration resource in the Media AF and to terminate the related content distribution. The HTTP DELETE method shall be used for this purpose, citing the well-known sub-resource of the target Provisioning Session in the request URL. As a result, the Media AF shall release any associated network resources, purge any cached content in the Media AS, and remove any corresponding configurations.

If the procedure is successful, the Media AF shall return a *200 (OK)* HTTP response message with an empty message body.

5.2.8.6 Purge Content Hosting cache operation

This operation is used by the Media Application Provider to purge content from the Media AS Content Hosting cache. The HTTP POST method shall be used for this purpose with a regular expression describing the media resource URLs to be purged provided in the body of the request. The message request body shall be encoded using the *application/x-www-form-urlencoded* MIME content type as a key-value pair, with the key being the string *pattern* and the value being the regular expression.

On receiving a purge request, the Media AF shall immediately invalidate all media resources in the Media AS cache matching the regular expression by declaring them as stale. A subsequent Media Client request at reference point M4 for a purged media resource will trigger the fetching (and possible caching) of the current version of the resource from the Media Application Provider's content origin via reference point M2 or from another Media AS via reference point M10 in case of a Pull-based ingest. For Push-based ingest, M4 requests for purged content shall be responded to with a *404 (Not Found)* HTTP response until such time as a new version of the object is published by the Media Application Provider to the Media AS via at reference point M2 or from another Media AS via reference point M10.

If the procedure is successful, the Media AF shall return one of the following response messages:

- *204 (No Content)* if no cache entries were purged, for example because no current cache entries matched the regular expression supplied in the original request. The response message body shall be empty in this case.
- *200 (OK)* if some cache entries were purged. The body of the response message shall indicate the total number of cache entries purged in all Media AS instances distributing the content.

The HTTP response *400 (Bad Request)* shall be returned in the case where the request message body – or the regular expression contained in it – are found by the Media AF to be syntactically malformed.

5.2.9 Content Publishing provisioning

5.2.9.1 General

These operations are used by the Media Application Provider at reference point M1 to provision the Content Publishing feature for uplink media delivery.

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.

5.2.9.2 Create Content Publishing Configuration resource operation

This operation is used by the Media Application Provider at reference point M1 to activate the Content Publishing feature for a particular Provisioning Session. The Media Application Provider shall use the HTTP POST method for this purpose. The request URL shall be a well-known sub-resource of the Provisioning Session resource, as specified in clause 8.9.2. The HTTP request message body shall be a Content Publishing Configuration resource representation, as specified in clause 8.9.3.1. There is at most one Content Publishing Configuration at a time for a given Provisioning Session.

Regarding the configuration of content egest from the Media AS to the Media Application Provider at reference point M2 or to another Media AS at reference point M10:

- If the Content Publishing Configuration uses the push-based content egest method, i.e., the *EgestConfiguration.mode* attribute is set to *PUSH*, then the *EgestConfiguration.baseURL* property shall be nominated by the Media Application Provider in the request message body. The Media AF shall return the *EgestConfiguration.baseURL* property value unchanged in its response message body.
- If the Content Publishing Configuration uses the pull-based content egest method, i.e., the *EgestConfiguration.mode* attribute is set to *PULL*, then the *EgestConfiguration.baseURL* property shall be nominated by the Media AF and returned in the response message body. It shall not be set by the Media Application Provider in the request message body.

Regarding the configuration(s) of content contribution by the Media Client to a Media AS service location at reference point M4 or from one Media AS to another at reference point M10:

- The Media Application Provider may define one or more contribution configurations in the *contributionConfigurations* array within a Content Publishing Configuration. When more than one content contribution configuration is provided in the HTTP request message body, the operation to create the Content Publishing Configuration resource shall be successful if and only if all such contribution configurations are acceptable to the Media AF.
- As a side-effect of provisioning, the Media AF associates a Media AS service location exposed at reference point M4 or M10 with every contribution configuration. A service location may be associated with one or more physical endpoints at the discretion of the Media AF, subject to guidance from the Media Application Provider as described below.

NOTE: When HTTP [24] is used as the media delivery protocol at reference point M4 or M10, a service location is distinguished by a unique combination of protocol, authority (host name and port) and base path. The same service location may be associated with different physical endpoints using techniques such as anycast IP routing or DNS round-robin resolution.

- Every contribution configuration shall be assigned an identification label by the Media Application Provider, unique within the scope of the parent Content Publishing Configuration, in the *ContributionConfiguration.contributionId* property. This identification label may be referenced from other resources in the Provisioning Session, such as a Content Preparation Template (see clause 5.2.5).
- A contribution configuration may be configured to ingest content at either reference point M4 or M10. In all cases where the contribution configuration is configured to ingest content at reference point M4, the *ContributionConfiguration.mode* shall be set to *PUSH*.
- The Media Application Provider may use the *ContributionConfiguration.affinityGroup* property to indicate to the Media AF that the physical endpoint(s) realising the Media AS service location associated with a contribution configuration may or may not be co-located with those of another service location associated with another contribution configuration defined in the same Content Publishing Configuration. The physical endpoint(s) of the Media AS service locations associated with contribution configurations declaring different *ContributionConfiguration.affinityGroup* values shall not be co-located.
- The *ContributionConfiguration.canonicalDomainName* and *ContributionConfiguration.baseURL* properties are:
 - Read-only at reference point M1 in all cases where the *ContributionConfiguration.mode* is set to *PUSH*. The *ContributionConfiguration.canonicalDomainName* and *ContributionConfiguration.baseURL* shall always be omitted from the creation request and shall be assigned by the Media AF, allowing their values to be inspected by the Media Application Provider in the returned Content Publishing Configuration resource representation, or by using the operation specified in clause 5.2.9.3 below.
 - Assigned by the Media Application Provider in all cases where *ContributionConfiguration.mode* is set to *PULL*. The Media AF shall return the Media AS *ContributionConfiguration.canonicalDomainName* and *ContributionConfiguration.baseURL* property values unchanged in its response body.
- If the *ContributionConfiguration.certificateId* property is present and valid, the Media AF shall assign a canonical domain name for the Media AS to expose at reference point M4 service locations that matches the Common Name and the first Subject Alternative Name in the referenced Server Certificate resource (taking into account wildcard matching) regardless of whether the corresponding X.509 certificate was created using the operation specified in clause 5.2.4.2 or those specified in clauses 5.2.4.3 and 5.2.4.4.
- The Media Application Provider may nominate an alternative domain name to be advertised to the Media Client in the Service Access Information by setting the *ContributionConfiguration.domainNameAlias* property when (and only when) creating the Content Publishing Configuration resource. If valid, the value of this property shall then appear in the *ContributionConfiguration.baseURL* assigned by the Media AF instead of *ContributionConfiguration.canonicalDomainName*. The Media Application Provider shall ensure that this domain name alias resolves to the canonical domain name of the Media AS notified by the Media AF in its response by means of suitable DNS configuration.

When the push-based content egest is from a downstream Media AS to an upstream Media AS at reference point M10, the following applies in addition:

- The upstream Media AS Content Publishing Configuration shall be provisioned first. It may use either the push-based content egest method, i.e., *EgestConfiguration.mode* is set to *PUSH*, or the pull-based content egest method, i.e., *EgestConfiguration.mode* is set to *PULL*.
- The *ContributionConfiguration.mode* for the contribution configuration defined in the upstream Media AS Content Publishing Configuration that is intended to ingest content from the downstream Media AS shall be set to *PUSH*.
- The downstream Media AS Content Publishing Configuration shall be provisioned after the upstream Media AS using the push-based content egress method, i.e., *EgestConfiguration.mode* is set to *PUSH*.
- The *EgestConfiguration.baseURL* property shall be set by the Media Application Provider in the request message body to be the same value as the *ContributionConfiguration.baseURL* of the contribution configuration of the upstream Media AS Content Publishing Configuration intended to ingest content from the downstream Media AS.

When pull-based content egest is from a downstream Media AS to an upstream Media AS at reference point M10, the following applies in addition:

- The downstream Media AS Content Publishing Configuration shall be provisioned first using the pull-based content egress method, i.e., the *EgestConfiguration.mode* property shall be set to *PULL*.
- The upstream Media AS Content Publishing Configuration shall be provisioned after the downstream Media AS. It shall use the pull-based content egest method, i.e., the *EgestConfiguration.mode* attribute is set to *PULL*, and it shall contain at least one contribution configuration intended to serve the downstream Media AS at reference point M10. This contribution configuration shall use the pull-based content contribution method, i.e., the *ContributionConfiguration.mode* shall be set to *PULL*.
- The *ContentConfiguration.baseURL* property of the upstream Media AS Content Publishing Configuration for the contribution configuration intended to ingest content from the downstream Media AS shall be set by the Media Application Provider to be the *EgestConfiguration.baseURL* of the downstream Media AS Content Publishing Configuration that was nominated by the Media AF and returned in the response message body when the downstream Media AS Content Publishing Configuration was provisioned.

If the operation is successful, the Media AF shall return a *201 (Created)* HTTP response message and the request URL shall be returned as the value of the *Location* HTTP header field. The response message body shall be a representation of the current state of the Content Publishing Configuration resource (see clause 8.9.3.1), including any properties assigned by the Media AF.

If any resources referenced by the supplied Content Publishing Configuration resource representation are invalid, 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 Content Publishing Configuration resource shall remain in an uncreated state in the Media AF.

If *ContributionConfiguration.domainNameAlias* is set in the supplied Content Publishing Configuration resource representation but its value is not a syntactically valid Fully-Qualified Domain Name or if the *ContributionConfiguration.certificateId* property is absent or if the supplied domain name alias does match any of one of the Subject Alternative Names listed in the Server Certificate referenced by the *ContributionConfiguration.certificateId* property, 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 Content Publishing Configuration resource shall remain in an uncreated state in the Media AF.

NOTE: Even if multiple contribution configurations in the same Content Publishing Configuration reference the same Server Certificate resource, they may each nominate a different domain name alias from among its Subject Alternative Names.

Attempting to create a Content Publishing Configuration in the scope of a Provisioning Session of any type other than *MS_UPLINK* 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 Content Publishing Configuration resource shall remain in an uncreated state in the Media AF.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Content Publishing Configuration, 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 Content Publishing Configuration resource shall remain in an uncreated state in the Media AF.

5.2.9.3 Retrieve Content Publishing Configuration resource operation

This operation is used by the Media Application Provider to retrieve the current state of an existing Content Publishing Configuration resource from the Media AF. The HTTP GET method shall be used for this purpose.

If the operation is successful, the Media AF shall return a *200 (OK)* response message that includes a representation of the target Content Publishing Configuration resource (see clause 8.9.3.1) in the response message body.

5.2.9.4 Update Content Publishing Configuration resource operation

This operation is invoked by the Media Application Provider to modify the properties of an existing Content Publishing Configuration resource. All writeable properties may be updated. The HTTP PATCH or HTTP PUT methods shall be used for this purpose.

When more than one content contribution configuration is provided in the HTTP request message body, the operation to update the Content Publishing Configuration resource shall be successful if and only if all such contribution configurations are acceptable to the Media AF.

If the HTTP request is acceptable but the operation results in no change to the resource representation, a *204 (No Content)* HTTP response message with an empty body should be returned.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* HTTP response message and shall provide a representation of the current state of the target resource in the message body to confirm successful update.

Attempts to modify read-only properties of the target Content Publishing Configuration resource, such as the canonical domain name of a contribution configuration, shall be rejected by the Media AF with a *403 (Forbidden)* HTTP response that includes an error message body per clause 7.1.7.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Content Publishing Configuration, the update 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 Content Publishing Configuration resource in the Media AF shall remain in the state immediately prior to the update operation.

5.2.9.5 Destroy Content Publishing Configuration resource operation

This operation is used by the Media Application Provider to destroy a Content Publishing Configuration resource and to terminate the related egest of content. The HTTP DELETE method shall be used for this purpose. As a result, the Media AF shall release any associated network resources, purge any cached content, and delete any corresponding configurations.

If the procedure is successful, the Media AF shall return a *204 (No Content)* HTTP response message with an empty message body.

5.2.9.6 Purge Content Publishing cache operation

When pull-based content egest is provisioned in the Content Publishing Configuration, this operation is used by the Media Application Provider to purge content from the Media AS Content Publishing cache. The HTTP POST method shall be used for this purpose with a regular expression describing the media resource URLs to be purged provided in the body of the request. The message request body shall be encoded using the *application/x-www-form-urlencoded* MIME content type as a key-value pair, with the key being the string *pattern* and the value being the regular expression.

On receiving a purge request, the Media AF shall immediately invalidate all media resources in the Media AS cache matching the regular expression by declaring them as stale. Requests at reference point M2 for purged media resources should be responded to with a *410 (Gone)* HTTP response or else a *404 (Not Found)* response.

If the procedure is successful, the Media AF shall return one of the following response messages:

- *204 (No Content)* if no cache entries were purged, for example because no current cache entries matched the regular expression supplied in the original request. The response message body shall be empty in this case.
- *200 (OK)* if some cache entries were purged. The body of the response message shall indicate the total number of cache entries purged in all Media AS instances egesting the content.

The HTTP response *400 (Bad Request)* shall be returned in the case where the request message body – or the regular expression contained in it – are found by the Media AF to be syntactically malformed.

5.2.10 Real-time Media Communication provisioning

5.2.10.1 General

These operations are used by the Media Application Provider at reference point M1 to provision the configuration information for RTC-based media delivery sessions.

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.

5.2.10.2 Create Real-time Media Communication Configuration resource operation

This operation is used by the Media Application Provider at reference point M1 to activate the RTC feature for a particular Provisioning Session. The Media Application Provider shall use the HTTP POST method for this purpose. The request URL shall be a well-known sub-resource of the Provisioning Session resource, as specified in clause 8.10.2. The HTTP request message body shall be an RTC Configuration resource representation, as specified in clause 8.10.3.1. There is at most one RTC Configuration resource at a time for a given Provisioning Session.

The Media Application Provider may request that the Media Delivery System provides additional support services to facilitate communication between Media Clients wishing to engage in an RTC-based media delivery session:

- If the *enableStunService* flag is set to *true*, the Media AF shall configure the Media AS to provide a STUN service to Media Clients and the Media AF shall populate information about the endpoint(s) of this service in *stunServerEndpoints*. Otherwise, the Media AS is not required to provide a STUN service. Otherwise, the Media Application Provider may populate *stunServerEndpoints* with information about a STUN service it provides.
- If the *enableTurnService* flag is set to *true*, the Media AF shall configure the Media AS to provide a TURN service to Media Clients and the Media AF shall populate information about the endpoint(s) of this service in *turnServerEndpoints*. Otherwise, the Media AS is not required to provide a TURN service. Otherwise, the Media Application Provider may populate *turnServerEndpoints* with information about a TURN service it provides.
- If the *enableSwapService* flag is set to *true*, the Media AF shall configure the Media AS to provide a SWAP service to Media Clients and the Media AF shall populate information about the endpoint(s) of this service in *swapServerEndpoints*. Otherwise, the Media AS is not required to provide a SWAP service. Otherwise, the Media Application Provider may populate *swapServerEndpoints* with information about a SWAP service it provides.

If the operation is successful, the Media AF shall return a *201 (Created)* HTTP response message, and the request URL shall be returned as the value of the *Location* HTTP header field. The response message body shall be a representation of the current state of the RTC Configuration resource (see clause 8.10.3.1), including any properties assigned by the Media AF.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied RTC Configuration, 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 RTC Configuration resource shall remain in an uncreated state in the Media AF.

5.2.10.3 Retrieve Real-time Media Communication Configuration resource operation

This operation is used by the Media Application Provider to retrieve the current state of an existing RTC Configuration resource from the Media AF. The HTTP GET method shall be used for this purpose.

If the operation is successful, the Media AF shall return a *200 (OK)* response message that includes a representation of the target RTC Configuration resource (see clause 8.10.3.1) in the response message body.

5.2.10.4 Update Real-time Media Communication Configuration resource operation

This operation is invoked by the Media Application Provider to modify the properties of an existing RTC Configuration resource. All writeable properties may be updated. The HTTP PATCH or HTTP PUT methods shall be used for this purpose.

If the HTTP request is acceptable but the operation results in no change to the resource representation, a *204 (No Content)* HTTP response message with an empty body should be returned.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* HTTP response message and shall provide a representation of the current state of the target resource in the message body to confirm successful update.

Attempts to modify read-only properties of the target RTC Configuration resource, such as the STUN service endpoint information, shall be rejected by the Media AF with a *403 (Forbidden)* HTTP response that includes an error message body per clause 7.1.7.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied RTC Configuration, the update 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 RTC Configuration resource in the Media AF shall remain in the state immediately prior to the update operation.

5.2.10.5 Destroy Real-time Media Communication Configuration resource operation

This operation is used by the Media Application Provider to destroy an RTC Configuration resource. The HTTP DELETE method shall be used for this purpose. As a result, the Media AF shall release any associated network resources and invalidate the configuration.

If the procedure is successful, the Media AF shall return a *204 (No Content)* HTTP response message with an empty message body.

5.2.11 Metrics Reporting provisioning

5.2.11.1 General

These operations are used by the Media Application Provider at reference point M1 to provision QoE metrics reporting functionality associated with downlink or uplink media delivery. The Media Application Provider may provision several Metrics Reporting Configurations within the scope of a Provisioning Session with different properties which determine whether and how often the Media Session Handler and/or Media AS (whichever is acting as metrics reporting entity) submits QoE metrics reports to the Media AF as well as the format and contents of these reports. To this end, each Metrics Reporting Configuration shall specify a *metrics scheme*, which may be specified by 3GPP or by another party. The chosen metrics scheme URI is indicated in the *scheme* property of the Metrics Reporting Configuration. This clause defines the basic operations; more details are provided in clause 8.11.

A given Metrics Reporting Configuration is uniquely identified within the scope of its parent Provisioning Session by the *metricsReportingConfigurationId* property of the corresponding Metrics Reporting Configuration resource, as specified in clause 8.11.3.1.

Where metrics reporting is not required for the entire duration of a media delivery session, *reportingStartOffset* and/or *reportingDuration* parameters may additionally be specified for a Metrics Reporting Configuration indicating the portion of each media delivery session for which metrics reports are to be submitted by the metrics reporting entity.

Where the reporting of a particular metric is required based on its value crossing specific thresholds:

- The *positiveCrossingThresholds* property may additionally be specified in a Metrics Reporting Configuration for one or more of the metrics present in the *metrics* property. When present, the metrics reporting entity shall report a metric once when its value exceeds one of the threshold values indicated in the *positiveCrossingThresholds* property and shall not be reported again until it falls below that threshold and subsequently exceeds it.
- The *negativeCrossingThresholds* property may additionally be specified in a Metrics Reporting Configuration for one or more of the metrics present in the *metrics* property. When present, the metrics reporting entity shall report a metric once when its value falls below one of the threshold values indicated in the *negativeCrossingThresholds* property and shall not be reported again until it exceeds that threshold and subsequently exceeds it.

Where metrics are required to be collected only in certain geographic locations, the *locationFilter* property may additionally be specified in a Metrics Reporting Configuration. When present, the metrics reporting entity shall collect the metrics described by the metrics reporting configuration only when the UE (or remote peer outside the Media Delivery System) is located in one or more geographic locations specified in the *locationFilter* property and shall report the collected metrics. When not present, the metrics reporting entity shall collect and report the metrics regardless of the device's geographic location.

NOTE: When the consumption reporting entity is a Media AS, it may be aware of the location of a remote peer outside the Media Delivery System.

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.

5.2.11.2 Create Metrics Reporting Configuration resource operation

This operation is used by the Media Application Provider to create a Metrics Reporting Configuration resource within the scope of an existing Provisioning Session. The Media Application Provider shall use the HTTP POST method for this purpose. The request URL shall be a well-known sub-resource of the Provisioning Session resource representing its Metrics Reporting Configurations resource collection, as specified in clause 8.11.2. The HTTP request message body shall be a Metrics Reporting Configuration resource representation, as specified in clause 8.11.3.1.

Upon successful creation of the resource, the Media AF shall return a *201 (Created)* response message and the resource URL for the newly-created Metrics Reporting Configuration resource, including its resource identifier, shall be returned as the value of the **Location** HTTP header field. The response message body shall be a representation of the current state of the Metrics Reporting Configuration resource (see clause 8.11.3.1), including any properties assigned by the Media AF.

If the metrics scheme or any of the metrics cited in the supplied Metrics Reporting Configuration is not supported by 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 Metrics Reporting Configuration resource shall remain in an uncreated state in the Media AF.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Metrics Reporting Configuration, 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 Metrics Reporting Configuration resource shall remain in an uncreated state in the Media AF.

This operation may be performed multiple times by a Media Application Provider to provision different Metrics Reporting Configuration resources within the scope of a Provisioning Session. Each such resource is assigned a different Metrics Reporting Configuration identifier by the Media AF.

5.2.11.3 Retrieve Metrics Reporting Configuration resource operation

This operation is used by the Media Application Provider to retrieve the current state of an existing Metrics Reporting Configuration resource in the Media AF. The HTTP GET method shall be used for this purpose, citing the resource identifier of the target Metrics Reporting Configuration in the request URL.

If successful, the Media AF shall return a *200 (OK)* HTTP response message that includes a representation of the target Metrics Reporting Configuration resource (see clause 8.11.3.1) in the response message body.

5.2.11.4 Update Metrics Reporting Configuration resource operation

This operation is invoked by the Media Application Provider to entirely replace or modify certain properties of an existing Metrics Reporting Configuration resource. All available properties may be updated. The HTTP PATCH or HTTP PUT methods shall be used for this purpose. The replacement Metric Reporting Configuration resource representation shall be provided in the body of the HTTP request message.

If the HTTP request is acceptable but the operation results in no change to the resource representation, a *204 (No Content)* HTTP response message with an empty body should be returned.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* HTTP response message that includes a representation of the current state of the target resource in the message body to confirm successful update.

If the metrics scheme or any of the metrics cited in the supplied Metrics Reporting Configuration is not supported by the Media AF, the update 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 Metrics Reporting Configuration resource in the Media AF shall remain in the state immediately prior to the update operation.

Attempts to modify read-only properties of the target Metrics Reporting Configuration resource shall be rejected by the Media AF with a *403 (Forbidden)* HTTP response that includes an error message body per clause 7.1.7.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Metrics Reporting Configuration, the update 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 Metrics Reporting Configuration resource in the Media AF shall remain in the state immediately prior to the update operation.

5.2.11.5 Destroy Metrics Reporting Configuration resource operation

This operation is used by the Media Application Provider to destroy a Metrics Reporting Configuration resource and to terminate the related metrics reporting procedure by Media Clients. The HTTP DELETE method shall be used for this purpose, citing the resource identifier of the target Metrics Reporting Configuration in the request URL. As a result, the Media AF shall release any associated resources, discard any pending metrics reports, and remove any corresponding configurations.

If the operation is successful, the Media AF shall return a *204 (No Content)* HTTP response message with an empty message body.

Any subsequent operations citing the resource identifier of a destroyed Metrics Reporting Configuration should result in a *410 (Gone)* or else a *404 (Not Found)* HTTP response message that includes an error message body per clause 7.1.7.

5.2.12 Consumption Reporting provisioning

5.2.12.1 General

These operations are used by the Media Application Provider at reference point M1 to activate and to configure consumption reporting functionality associated with media delivery for downlink media streaming sessions or RTC sessions. The Media Application Provider may provision a single Consumption Reporting Configuration within the scope of a Provisioning Session which determines whether and how often the Media Session Handler and/or the Media AS submits consumption reports to the Media AF. This clause defines the basic operations. More details are provided in clause 8.12.

NOTE: The Consumption Reporting feature is not applicable to uplink media streaming.

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.

5.2.12.2 Create Consumption Reporting Configuration resource operation

This operation is used by the Media Application Provider to activate the Consumption Reporting feature for a particular Provisioning Session. The Media Application Provider shall use the HTTP POST method for this purpose. The request URL shall be a well-known sub-resource of the Provisioning Session resource, as specified in clause 8.12.2. The HTTP request message body shall be a Consumption Reporting Configuration resource representation, as specified in clause 8.12.3.1. There is at most one Consumption Reporting Configuration at a time for a given Provisioning Session.

Upon successful creation of the resource, the Media AF shall return a *201 (Created)* response message and the request URL shall be returned as the value of the **Location** HTTP header field. The response message body shall be a representation of the current state of the Consumption Reporting Configuration resource (see clause 8.12.3.1), including any properties assigned by the Media AF.

If the supplied Consumption Reporting Configuration is not supported by 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 Consumption Reporting Configuration resource shall remain in an uncreated state in the Media AF.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Consumption Reporting Configuration, 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 Consumption Reporting Configuration resource shall remain in an uncreated state in the Media AF.

5.2.12.3 Retrieve Consumption Reporting Configuration resource operation

This operation is used by the Media Application Provider to obtain the current Consumption Reporting Configuration from the Media AF. The HTTP GET method shall be used for this purpose.

If successful, the Media AF shall return a *200 (OK)* HTTP response message that includes a representation of the target Consumption Reporting Configuration resource (see clause 8.12.3.1) in the response message body.

5.2.12.4 Update Consumption Reporting Configuration resource operation

This operation is invoked by the Media Application Provider to modify the current Consumption Reporting Configuration. All available parameters may be updated. The HTTP PATCH or HTTP PUT methods shall be used for this purpose. The replacement Consumption Reporting Configuration resource representation shall be provided in the body of the HTTP request message.

If the HTTP request is acceptable but the operation results in no change to the resource representation, a *204 (No Content)* HTTP response message with an empty body should be returned.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* HTTP response message that includes a representation of the current state of the Consumption Reporting Configuration resources to confirm successful update.

If the supplied Consumption Reporting Configuration is not acceptable to the Media AF, the update 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 Consumption Reporting Configuration resource shall remain in the state immediately prior to the update operation.

Attempts to modify read-only properties of the target Consumption Reporting Configuration resource shall be rejected by the Media AF with a *403 (Forbidden)* HTTP response that includes an error message body per clause 7.1.7.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Consumption Reporting Configuration, the update 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 Consumption Reporting Configuration resource in the Media AF shall remain in the state immediately prior to the update operation.

5.2.12.5 Destroy Consumption Reporting Configuration resource operation

This operation is used by the Media Application Provider to destroy the Consumption Reporting Configuration resource and to terminate the related consumption reporting procedure by Media Clients. The HTTP DELETE method shall be used for this purpose, citing the well-known sub-resource of the target Provisioning Session in the request URL. As a result, the Media AF shall release any associated resources, purge any cached data, and remove any corresponding configurations.

If the operation is successful, the Media AF shall return a *204 (No Content)* HTTP response message with an empty message body.

5.2.13 Event Data Processing provisioning

5.2.13.1 General

These operations are used by the Media Application Provider at reference point M1 to configure the collection and processing of UE data related to media delivery (as defined in TS 26.531 [46]) and to restrict its exposure over reference points R5 and R6 by configuring the Data Collection AF instantiated in the Media AF (such as that defined in clause 4.7 of TS 26.501 [4]) with one or more Event Data Processing Configurations and Data Access Profiles for a particular Event ID. The Media Application Provider may provision several Event Data Processing Configurations within the scope of a Provisioning Session with different properties.

Each instance of a Data Access Profile specifies a set of data processing operations to be performed by the Data Collection AF on its collected UE data in order to synthesize the event data to be exposed to a specific Event service consumer entity. In this release, eligible Event service consumer entities of Media Delivery event data are the NWDAF, the Event Consumer AF and the NEF.

The Event Data Processing Provisioning API is specified in clause 8.13.

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.

5.2.13.2 Create Event Data Processing Configuration resource operation

This operation is used by the Media Application Provider to create a new Event Data Processing Configuration within the scope of an existing Provisioning Session in the form of one or more Data Access Profiles. The HTTP POST method

shall be used for this purpose. The request URL shall be a well-known sub-resource of the Provisioning Session resource representing its Event Data Processing Configurations resource collection, as specified in clause 8.13.2. The request message body shall be an Event Data Processing Configuration resource representation, as specified in clause 8.13.3.1.

If the operation is successful, the Media AF shall generate a resource identifier representing the new Event Data Processing Configuration. In this case, the Media AF shall return a *201 (Created)* response message and the URL of the newly created 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 Event Data Processing Configuration resource (see clause 8.13.3.1), including any properties assigned by the Media AF.

If the event identified in the supplied Event Data Processing Configuration is not supported by the Media AF, or if any of the data access profiles are unacceptable, 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 Event Data Processing Configuration resource shall remain in an uncreated state in the Media AF.

If the Data Collection AF is not instantiated in the Media AF, the create operation shall fail with an HTTP response status code of *404 (Not Found)* and an error message body per clause 7.1.7. In this case, the Event Data Processing Configuration resource shall remain in an uncreated state in the Media AF.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Event Data Processing Configuration, 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 Event Data Processing Configuration resource shall remain in an uncreated state in the Media AF.

This operation may be performed multiple times by a Media Application Provider to provision different Event Data Processing Configuration resources within the scope of a Provisioning Session. Each such resource is assigned a different Event Data Processing Configuration identifier by the Media AF.

5.2.13.3 Retrieve Event Data Processing Configuration resource operation

This operation is used by the Media Application Provider to retrieve the current state of an existing Event Data Processing Configuration resource in the Media AF. The HTTP GET method shall be used for this purpose, citing the resource identifier of the target Event Data Processing Configuration in the request URL.

If successful, the Media AF shall return a *200 (OK)* HTTP response message that includes a representation of the target Event Data Processing Configuration resource (see clause 8.13.3.1) in the response message body.

5.2.13.4 Update Event Data Processing Configuration resource operation

This operation is invoked by the Media Application Provider to entirely replace or modify certain properties of an existing Event Data Processing Configuration resource. All available properties may be updated. The HTTP PATCH or HTTP PUT methods shall be used for this purpose. The replacement Event Data Processing Configuration resource representation shall be provided in the body of the HTTP request message.

If the HTTP request is acceptable but the operation results in no change to the resource representation, a *204 (No Content)* HTTP response message with an empty body should be returned.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* HTTP response message that includes a representation of the current state of the target resource in the message body to confirm successful update.

If the event identified in the supplied Event Data Processing Configuration is not supported by the Media AF, or if any of the data access profiles are unacceptable, the update 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 Event Data Processing Configuration resource in the Media AF shall remain in the state immediately prior to the update operation.

Attempts to modify read-only properties of the target Event Data Processing Configuration resource shall be rejected by the Media AF with a *403 (Forbidden)* HTTP response that includes an error message body per clause 7.1.7.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Event Data Processing Configuration, the update 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 Event Data Processing Configuration resource in the Media AF shall remain in the state immediately prior to the update operation.

5.2.13.5 Destroy Event Data Processing Configuration resource operation

This operation is used by the Media Application Provider to destroy an existing Event Data Processing Configuration resource and to terminate the related collection of UE data and exposure of events to event consumer subscribers. The HTTP DELETE method shall be used for this purpose, citing the resource identifier of the target Event Data Processing Configuration in the request URL. As a result, the Data Collection AF shall process any reported UE data still outstanding and shall delete any corresponding data collection and reporting client configurations as well as any event subscriptions.

If the operation is successful, the Media AF shall return a *204 (No Content)* HTTP response message with an empty message body.

Any subsequent operations citing the resource identifier of a destroyed Event Data Processing Configuration should result in a *410 (Gone)* or else a *404 (Not Found)* HTTP response message that includes an error message body per clause 7.1.7.

5.3 Network media session handling (M3, M5) interactions

5.3.1 Overview

This clause specifies the set of operations used by the Media Session Handler within a Media Client to invoke services on the Media AF at reference point M5 relating to downlink or uplink media delivery. A subset of these operations is also exposed by the Media AF to the Media AS at reference point M3.

5.3.2 Service Access Information acquisition

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 *qoSSpecifications* array of the corresponding Policy Template has a *pduSetMarking* property set *true*.
- The *downlinkDataBurstSizeMarkingRequired* flag shall be present and set *true* if *downlinkDataBurstSizeMarkingRequired* property set *true*.
- The *downlinkTimeToNextBurstMarkingRequired* flag shall be present and set *true* if *downlinkTimeToNextBurstMarkingRequired* property set *true*.
- The *downlinkExpeditedTransferIndicationMarkingRequired* flag shall be present and set *true* if *downlinkExpeditedTransferIndicationMarkingRequired* 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 5G System supports ECN marking for L4S functionality. Otherwise, the corresponding *l4SEnablementPreference* flag shall be omitted or set to *false* in the corresponding Policy Template Binding.
- 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 the 5G System supports the QoS monitoring feature. Otherwise, the corresponding *qoSMonitoringEnablementPreference* flag shall be omitted or set to *false* in the corresponding Policy Template Binding.

NOTE: Before distributing the Service Access Information to the Media Session Handler, the Media AF may query the set of features supported by the 5G System as described in clause 6.6.2 of TS 29.500 [30].

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.

5.3.2.2 Create Service Access Information resource operation

The Create operation is not permitted for the Service Access Information resource collection. Any usage of the HTTP POST method shall result in the HTTP response *405 (Method Not Allowed)*.

5.3.2.3 Retrieve Service Access Information resource operation

This operation shall be used by the Media Session Handler to acquire Service Access Information from the Media AF. The Media Session Handler shall use the GET method for this purpose, citing the external service identifier associated with the target Provisioning Session (see clause 5.2.3) in the request URL. The request message body shall be empty.

If successful, the Media AF shall reply with a *200 (OK)* HTTP response message that includes a representation of the Service Access Information associated with the target media streaming session resource in the response message body, along with HTTP response headers in line with clause 7.1.4.2.

Once it has obtained an initial set of Service Access Information, the Media Session Handler shall periodically check for updated Service Access Information by issuing a conditional HTTP GET request in line with clause 7.1.4.3. The periodicity of polling for updated Service Access Information shall be guided by the value of the *Expires* and/or *Cache-control: max-age* headers that shall be included along with every response message for this operation.

The Media AF instance may nominate an MQTT [50] endpoint URL in the *notificationURL* property of the Service Access Information resource representation it returns to the Media Session Handler. If this property is present, the Media Session Handler shall connect to the MQTT channel at the indicated endpoint and subscribe to the root topic as described in clause 10.2.2. The usage and message formats for MQTT are described in clause 10.2.3. The Media AF shall notify the Media Session Handler about updates to the Service Access Information resource corresponding to the root topic of the MQTT channel.

5.3.2.4 Update Service Access Information resource operation

The Update operation is not permitted for members of the Service Access Information resource collection. Any usage of the HTTP PUT or PATCH methods in relation to the URLs of its members shall result in the HTTP response *405 (Method Not Allowed)*.

5.3.2.5 Destroy Service Access Information resource operation

The Destroy operation is not permitted for members of the Service Access Information resource collection. Any usage of the HTTP DELETE method in relation to the URLs of its members shall result in the *405 (Method Not Allowed)* HTTP response.

5.3.3 Dynamic Policy invocation

5.3.3.1 Procedures

To take advantage of the Dynamic Policy feature of the Media Delivery System, a Media Session Handler or Media AS (whichever is acting as Dynamic Policy invoker) instantiates a Policy Template that was previously provisioned within the scope of a Provisioning Session using the operations specified in clause 5.2.7. The parameters in the Policy Template are used by the Media AF in combination with a dynamic QoS specification supplied by the Dynamic Policy invoker to request specific QoS and/or charging policies from the PCF (either directly or via the NEF, as specified in clause 5.5.3) for that media delivery session.

The following procedures are followed by a Dynamic Policy invoker to manage Dynamic Policy Instance resources in the Media AF via reference point M5. Instantiating a Policy Template as a dynamic policy requires a Policy Template identifier (provided in Service Access Information that is either retrieved from the Media AF using the operation specified in clause 5.3.2.3 or else supplied via reference point M6), a set of Service Data Flow description(s), an optional dynamic QoS specification and potentially other parameters defined in clause 5.7 of TS 26.501 [4].

- The Policy Template identifier identifies the desired Policy Template (as previously provisioned per clause 5.2.7.3) to be applied to the specified application flow(s). A Policy Template includes properties such as specific QoS (e.g. background data) or different charging treatments.
- The Media AF combines the information from the Policy Template with dynamic QoS specification supplied by the Dynamic Policy invoker and uses this complete set of parameters to invoke the PCF according to clause 5.5.3.
- The set of Service Data Flow description(s) allow the identification and classification by the 5G System of the application traffic involved in a media delivery session. These take the form of an IP packet filter set (as defined in clause 5.7.6 of [2]) or the Fully-Qualified Domain Name (FQDN) of a Media AS at reference point M4.
- The Dynamic Policy Instance may specify a target network slice and Data Network Name.

NOTE: It is not defined in this release how a Media AF in an external Data Network selects a specific DNN or S-NSSAI.

The application flow specifications for Dynamic Policy Instances relating to concurrent media delivery sessions at the same Media Client shall be non-overlapping. The Media AF is responsible for enforcing these constraints.

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.

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, as well as to indicate the desired PDU Set Importance (PSI) value for N6-unmarked downlink PDUs on the application flow in question.

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, as well as to indicate the desired PDU Set Importance (PSI) value for N6-unmarked downlink PDUs on the application flow in question.

When the policy binding for the chosen Policy Template indicates that data burst size marking is enabled (i.e., *downlinkDataBurstSizeMarkingRequired* 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 data burst with the size of that data burst.

When the policy binding for the chosen Policy Template indicates that time to next burst marking is enabled (i.e., *downlinkTimeToNextBurstMarkingRequired* 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 data burst with the predicted time to the next burst.

When the policy binding for the chosen Policy Template indicates that expedited transfer indication marking is enabled (i.e., *downlinkExpeditedTransferIndicationMarkingRequired* 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 with the expedited transfer indication.

When the policy binding for the chosen Policy Template indicates that expedited transfer indication marking is enabled (i.e., *downlinkExpeditedTransferIndicationMarkingRequired* is set to *true* in Service Access Information), the Dynamic Policy invoker shall also populate two *ApplicationFlowBinding* objects in the *applicationFlowBindings* array, one with the *downlinkExpeditedTransferIndication* set to *true* and the other with this property set to *false*. The remainder of *applicationFlowDescription* properties of the two *ApplicationFlowBinding* objects shall be populated identically and shall declare the same Service Data Flow template describing the same application flow for which expedited transfer indication marking is sometimes desired.

When multiple media streams are multiplexed into a single application flow, the Dynamic Policy invoker may also populate the *uplinkMultiplexedMediaInfos* and *downlinkMultiplexedMediaInfos* properties (as applicable) with the *media identification information* parameters to be used by the 5G System for traffic detection and differentiated QoS on the uplink and downlink respectively. The population of objects in these arrays is not further specified in the present document.

- For uplink-only application flows, including those terminating on a Media AS, the *downlinkMultiplexedMediaInfos* property shall be omitted.
 - For downlink-only application flows, including those originating from a Media AS, the *uplinkMultiplexedMediaInfos* property shall be omitted.
 - For application flows carrying multiplexed media flows between two Media Clients (i.e., uplink followed by downlink via the UPF at reference point M12 or via Media AS at reference point M4), both the *uplinkMultiplexedMediaInfos* and *downlinkMultiplexedMediaInfos* properties shall be present. The population of these two arrays may be further constrained by the media delivery system.
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.
 - *downlinkExpeditedTransferIndication* may be populated and shall be set to *true* for QoS requirements that apply to application flows requiring expedited transfer from the network in both uplink and downlink directions. When *downlinkExpeditedTransferIndication* is set to *true*, the *downlinkBitRates* and *uplinkBitRates* properties shall be populated identically. If *downlinkExpeditedTransferIndication* is omitted or set to *false*, the QoS requirements apply to non-expedited transfer.
 - 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 *maximumDownlinkBitRate* and *maximumUplinkBitRate* 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 is unable to provision the resources required by the supplied Dynamic Policy Instance, 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.

5.3.3.3 Retrieve Dynamic Policy Instance resource operation

This operation is used by the Media Session Handler or Media AS (whichever is acting as Dynamic Policy invoker) to retrieve the current state of an existing Dynamic Policy Instance resource in the Media AF. HTTP GET method shall be used for this purpose, citing the resource identifier of the target Dynamic Policy Instance in the request URL.

If successful, the Media AF shall return a *200 (OK)* HTTP response message that includes a representation of the target Dynamic Policy Instance resource (see clause 9.3.3.1) in the response message body.

5.3.3.4 Update Dynamic Policy Instance resource operation

This operation is invoked by the Media Session Handler or Media AS (whichever is acting as Dynamic Policy invoker) to entirely replace or modify certain properties of an existing Dynamic Policy resource. All available properties may be updated. The HTTP PATCH or HTTP PUT methods shall be used for this purpose, citing the resource identifier of an existing Dynamic Policy Instance in the request URL. The replacement Dynamic Policy Instance resource representation shall be provided in the body of the HTTP request message.

If all required information is set in the replacement Dynamic Policy Instance, the Media AF shall trigger the appropriate actions towards other Network Functions in the 5G System according to clause 5.5.3 to update the associated PCC rule in line with the modified QoS and charging policy.

If the HTTP request is acceptable but the operation results in no change to the resource representation, a *204 (No Content)* HTTP response message with an empty body should be returned.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* HTTP response message that includes a representation of the current state of the target resource in the message body to confirm successful update.

If the supplied Dynamic Policy Instance is not acceptable to the Media AF, the update 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 the state immediately prior to the update operation.

Attempts to modify read-only properties of the target Dynamic Policy Instance resource shall be rejected by the Media AF with a *403 (Forbidden)* HTTP response that includes an error message body per clause 7.1.7.

If the request is acceptable but the Media AF forbids the instantiation of the referenced Policy Template, for example because the UE is not permitted in the charging specification, the update 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 the state immediately prior to the update operation.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Dynamic Policy Instance, the update 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 the state immediately prior to the update operation.

5.3.3.5 Destroy Dynamic Policy Instance resource operation

This operation is invoked by the Media Session Handler or Media AS (whichever is acting as Dynamic Policy invoker) to destroy an existing Dynamic Policy Instance resource. The HTTP DELETE method shall be used for this purpose, citing the resource identifier of the target Dynamic Policy Instance in the request URL. As a result, the Media AF shall trigger the appropriate actions towards other Network Functions in the 5G System according to clause 5.5.3 to remove the associated PCC rule and to revert the affected application flow(s) to a default QoS and charging policy.

If the operation is successful, the Media AF shall return a *204 (No Content)* HTTP response message with an empty message body.

No further MQTT notification messages shall be published by the Media AF on the sub-topic corresponding to the resource identifier of the destroyed resource. The Dynamic Policy invoker shall unsubscribe from the sub-topic corresponding to this resource identifier.

Any subsequent operations citing the resource identifier of a destroyed Dynamic Policy Instance should result in a *410 (Gone)* or else a *404 (Not Found)* HTTP response message that includes an error message body per clause 7.1.7.

5.3.4 Network Assistance invocation

5.3.4.1 Procedures

The following procedures are followed by the Media Session Handler or Media AS (whichever is acting as Network Assistance invoker) to request Network Assistance from one of the Media AF instances listed in the *serverAddresses* property of the Network Assistance Configuration which is part of the Service Access Information that is either retrieved from the Media AF using the operation specified in clause 5.3.2.3 or else supplied via reference point M6.

1. The Network Assistance invoker first creates a Network Assistance Session with its chosen Media AF instance. It provides information that will later be used by the Media AF to request a particular network QoS to be applied by the PCF to one or more application data flows, and to recommend a bit rate to the Media Client. The Media AF assigns a resource identifier to the Network Assistance Session at the point of creation. This procedure is further specified in clause 5.3.4.2.
2. The Network Assistance Session resource may be retrieved by the Network Assistance invoker using the procedure specified in clause 5.3.4.3.
3. At any time after the Network Assistance Session resource is created, the Network Assistance invoker may use the Network Assistance Session resource identifier to explicitly request a bit rate recommendation by invoking a remote procedure call provided for this purpose by the Media AF. This procedure is further specified in clause 5.3.4.4.
4. Using the Network Assistance Session resource identifier, the Network Assistance invoker may also request a delivery boost to be provided by the 5G System at any time by invoking a remote procedure call provided for this purpose by the Media AF. This procedure is further specified in clause 5.3.4.5.

5. The information provided when first creating a Network Assistance Session may be modified subsequently by the Network Assistance invoker using the session modification operation specified in clause 5.3.4.6.
6. In order to terminate a Network Assistance Session, the Network Assistance invoker destroys the Network Assistance Session resource using the procedure specified in clause 5.3.4.7.

Details of the APIs supporting these procedures at reference point M5 are specified in clause 9.4.

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.

5.3.4.2 Create Network Assistance Session resource operation

This operation is used by the Media Session Handler or Media AS (whichever is acting as Network Assistance invoker) to create a Network Assistance Session in the Media AF. The POST HTTP method shall be used for this purpose and the request message body shall be a Network Assistance Session resource representation as specified in clause 9.4.3.1.

1. The *provisioningSessionId* property associates the Network Assistance Session with a Provisioning Session.
2. The *slice* property associates the Network Assistance Session with a specific network slice.
3. The *dataNetworkName* property associates the Network Assistance Session with a specific named Data Network.
4. The Network Assistance invoker shall populate the Network Assistance Session resource representation in the request with service data flow information and optionally the Policy Template identifier of the network QoS policy currently in force on the media streaming session for which Network Assistance operations are to be performed. (The Media AF subsequently uses this information to execute Network Assistance operations in the 5G Core.)

The *applicationFlowDescription* property of the Network Assistance Session resource representation shall be populated by the Network Assistance invoker and shall declare a Service Data Flow template according to TS 23.503 [33] that describes the application flow for which network assistance is sought. 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 Session Handler shall not attempt to instantiate more than one Network Assistance Session at the same time that cites the same packet filter.
- a *domainName* populated with the fully-qualified Internet domain name of a Media AS at reference point M4. A Media Session Handler shall not attempt to instantiate more than one Network Assistance Session 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.

The *mediaTransportParameters* property shall be omitted.

5. The *requestedQoS* property may be provided in the Network Assistance Session resource representation to specify an initial network QoS the Network Assistance invoker wishes to use for the media streaming session. If the *policyTemplateId* property is also populated in the Network Assistance Session resource representation, the Media AF shall return a 400 (*Bad Request*) HTTP response message if the requested network QoS lies outside the limits specified in the referenced Policy Template.
 - If the *requestedQoS* property is omitted from the Network Assistance Session resource representation but the *policyTemplateId* is populated, the Media AF shall use the network QoS currently provisioned in the referenced Policy Template as the floor/ceiling for bit rate recommendations and delivery boosts within the scope of the Network Assistance Session.
 - If neither a *policyTemplateId* nor a *requestedQoS* are supplied when creating a Network Assistance Session, operations invoked on the Media AF within the scope of the Network Assistance Session are constrained only by the policies of the PCF. Upon successful creation, the Media AF shall return a 201 (*Created*) response message and the URL of the newly created resource, including its Network Assistance Session 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 Network Assistance Session resource (see clause 9.4.3.1), including any properties assigned by the Media AF.

If the operation is successful, the Media AF shall create a new Network Assistance Session resource. In this case, the Media AF shall return a *201 (Created)* HTTP response message to the Network Assistance invoker, and the URL of the newly created Network Assistance Session 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 Network Assistance Session resource (see clause 9.4.3.1), including any properties assigned by the Media AF.

Upon successful creation of the Network Assistance Session resource, notifications of updates to the resource may be notified asynchronously to the Network Assistance invoker:

- If the *notificationURL* property is present in the Service Access Information, the Network Assistance invoker shall subscribe to the MQTT sub-topic corresponding to the *resourceId* of the Network Assistance Session, and shall expect to receive asynchronous notifications published by the Media AF on the MQTT notification channel of type *NOTIFICATION_NETWORK_ASSISTANCE_SESSION* concerning changes to the Network Assistance Session, including an up-to-date bit rate recommendation whenever this changes.
- The Media AF shall use MQTT the notification channel signalled in the Service Access Information (if any, see clause 5.3.2.3) to notify subscribers of updates to the Network Assistance Session resource. A notification message of type *NOTIFICATION_NETWORK_ASSISTANCE_SESSION* shall be published to the MQTT sub-topic corresponding to the *resourceId* of the Network Assistance Session.

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

When the Network Assistance Session is successfully instantiated, the Media AF triggers the creation of a corresponding PCC rule in the 5G System according to clause 5.5.4 to enforce the required QoS on the specified application flow(s). Depending on the *ApplicationFlowDescriptor* objects in the received Network Assistance Session 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 Network Assistance Session 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 Network Assistance Session resource shall remain in an uncreated state in the Media AF.

If the request is acceptable but the Media AF forbids the use of the referenced Policy Template in a Network Assistance Session, for example 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 Network Assistance Session resource shall remain in an uncreated state in the Media AF.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Network Assistance Session, 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 Network Assistance Session resource shall remain in an uncreated state in the Media AF.

The Media Client uses the Network Assistance Session resource identifier (*naSessionId*) provided by the Media AF to refer all subsequent API calls to the Media AF instance responsible for that Network Assistance Session.

5.3.4.3 Retrieve Network Assistance Session resource operation

This operation is used by the Media Session Handler or Media AS (whichever is acting as Network Assistance invoker) to retrieve the current state of a Network Assistance Session resource from the Media AF. The HTTP GET method shall be used for this purpose, citing the resource identifier of the target Network Assistance Session in the request URL.

If the operation is successful, the Media AF shall return *200 (OK)* and shall provide a representation of the requested resource in the HTTP message response body.

5.3.4.4 Bit rate recommendation request operation

This operation is used by the Media Session Handler or Media AS (whichever is acting as Network Assistance invoker) to request a bit rate recommendation from the Media AF. the HTTP GET method shall be used for this purpose, citing the resource identifier of an existing Network Assistance Session in the request URL along with a sub-resource path indicting the bit rate recommendation operation.

If the operation is successful, the Media AF shall return a *200 (OK)* HTTP response message and shall provide the recommended bit rate(s) in an HTTP response message body containing a *ClientPolicySpecification* object that is populated as follows:

- For a downlink media delivery session, the recommended minimum and maximum downlink bit rates shall be indicated in the properties *minimumRequestedBitRate* and *maximumBitRate* respectively of the *downlinkBitRates* object. If a unique downlink bit rate is recommended by the Media AF, then this value shall be set identically in both of these properties. The Network Assistance invoker shall in this case ignore the mandatory properties related to uplink media delivery, i.e., *uplinkBitRates*.
- For an uplink media delivery session, the recommended minimum and maximum uplink bit rates shall be indicated in the properties *minimumRequestedBitRate* and *maximumRequestedBitRate* respectively of the *uplinkBitRates* object. If a unique uplink bit rate is recommended by the Media AF, then this value shall be set identically in both of these properties. The Network Assistance invoker shall in this case ignore the mandatory properties related to downlink media delivery, i.e., *downlinkBitRates*.

The optional properties *minimumDesiredBitRate*, *desiredPacketLatency* and *desiredPacketLoss* shall not be included in the returned *ClientPolicySpecification* object.

If the Media AF refuses to provide a bit rate recommendation, for example because the Provisioning Session in question currently lacks the rights required to receive this information, the operation shall fail with an HTTP response status code of *403 (Forbidden)* and an error message body per clause 7.1.7.

5.3.4.5 Delivery boost request operation

This operation is used by the Media Session Handler or Media AS (whichever is acting as Network Assistance invoker) to request a delivery boost from the Media AF. the HTTP POST method shall be used for this purpose, citing the resource identifier of an existing Network Assistance Session in the request URL along with a sub-resource path indicating the delivery boost operation.

If the operation is successful, the Media AF shall return a *200 (OK)* HTTP response message and shall provide an *OperationSuccessResponse* object (see clause 7.3.3.9) in the message body indicating whether or not the delivery boost was successfully applied by the Media AF to the application data flow(s) described in the target Network Assistance Session.

If the Media AF refuses to provide the requested delivery boost, for example because the Provisioning Session in question currently lacks the rights required to receive a boost, the operation shall fail with an HTTP response status code of *403 (Forbidden)* and an error message body per clause 7.1.7.

5.3.4.6 Update Network Assistance Session resource operation

This operation is used by the Media Session Handler or Media AS (whichever is acting as Network Assistance invoker) to replace the steaming session parameters in an existing Network Assistance Session resource with new values. The HTTP PUT or PATCH methods shall be used for this purpose, citing the resource identifier of an existing Network Assistance Session in the request URL. Any change to the Policy Template currently in force resulting from instantiation of a Dynamic Policy (see clause 5.3.3) should also be notified to the Media AF using this operation if a Network Assistance session has been created for the media delivery session in question.

If the HTTP request is acceptable but the operation results in no change to the resource representation, a *204 (No Content)* HTTP response message with an empty body should be returned.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* HTTP response message and shall provide a representation of the current state of the resource in the message body to confirm successful update.

If the supplied Network Assistance Session is not acceptable to the Media AF, the update 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 Network Assistance Session resource shall remain in the state immediately prior to the update operation.

Attempts to modify read-only properties of the target Network Assistance Session resource shall be rejected by the Media AF with a *403 (Forbidden)* HTTP response that includes an error message body per clause 7.1.7.

If the request is acceptable but the Media AF forbids the use of the referenced Policy Template in a Network Assistance Session, for example because the UE is not permitted in the charging specification, the update 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 Network Assistance Session resource shall remain in the state immediately prior to the update operation.

If the request is acceptable but the Media AF is unable to provision the resources required by the supplied Network Assistance Session, the update 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 Network Assistance Session resource shall remain in the state immediately prior to the update operation.

5.3.4.7 Destroy Network Assistance Session resource operation

This operation is used by the Media Session Handler or Media AS (whichever is acting as Network Assistance invoker) to terminate a Network Assistance Session. The HTTP DELETE method shall be used for this purpose, citing the resource identifier of the target Network Assistance Session in the request URL.

If the operation is successful, the Media AF shall return a *204 (No Content)* HTTP response message with an empty message body.

No further MQTT notification messages shall be published by the Media AF to the sub-topic corresponding to the resource identifier of the destroyed resource. The Network Assistance invoker shall unsubscribe from the sub-topic corresponding to this resource identifier.

Any subsequent operations citing the resource identifier of a destroyed Network Assistance Session should result in a *410 (Gone)* or else a *404 (Not Found)* HTTP response message that includes an error message body per clause 7.1.7.

5.3.5 Metrics reporting

5.3.5.1 Procedures

These procedures are used by the Media AS at reference point M3 or else by the Metrics Reporting functions of the Media Client and subsequently by the Media Session Handler at reference point M5 to submit a metrics report to one of the Media AF instances listed in the client metrics reporting configuration of the Service Access Information resource previously retrieved using the procedure in clause 5.3.2.3.

- When the metrics collection and reporting feature is provisioned for media delivery sessions using the operations specified in clause 5.2.11, one or more client metrics reporting configurations, each associated with a provisioned Metrics Reporting Configuration, shall be provided to the Media Session Handler and the Media AS (both acting in this case as metrics reporting entity) in the Service Access Information.
- When the metrics collection and reporting feature is provisioned for RTC sessions using the operations specified in clause 5.2.11, one or more client metrics reporting configurations, each associated with a provisioned Metrics Reporting Configuration, shall be provided to the Media Session Handler and the Media AS (both acting in this case as metrics reporting entity) in the Service Access Information.

A given client metrics reporting configuration contains information including:

1. The subset of metrics from the provisioned metrics scheme to be collected and reported by the metrics reporting entity;
2. The frequency at which these metrics are to be sampled by the metrics reporting entity;
- 2a. Thresholds for certain metrics, the crossing of which drives their reporting by the metrics reporting entity;

2b. The locations of the Media Client (or remote peer outside the Media Delivery System) where metrics collection is requested;

NOTE: When the metrics reporting entity is a Media AS, it may be aware of changes to the location of a remote peer outside the Media Delivery System.

3. The proportion of media delivery sessions for which metrics reports are to be sent by the metrics reporting entity;
4. The portion of the media session (represented by start offset and/or duration parameters) for which metrics reports are to be sent by the metrics reporting entity if reporting is enabled for that media delivery session;
5. The interval at which metrics reports are to be sent by the metrics reporting entity if reporting is enabled for a media delivery session; and
6. The Media AF address(es) to which metrics reports are to be sent.

Furthermore:

- Before a media delivery session is started, the metrics reporting entity shall check if the Service Access Information includes any Client Metrics Reporting Configurations. If any such configurations are present, the metrics reporting entity shall initiate the metrics reporting procedure for the media delivery session based on these configurations.
- During the course of the media delivery session, the metrics reporting entity shall periodically check if any Metrics Reporting Configurations have been added to or removed from the Service Access Information and shall activate or deactivate the metrics reporting procedure as appropriate for the media delivery session in question.

The data type of the Metrics Reporting Configuration signalled as part of the Service Access Information indicating at reference point M5 is specified in clause 9.2.3.

The metrics reporting entity shall decide whether to activate the metrics reporting procedure for a particular media delivery session at the start of that session and whenever any Client Metrics Reporting Configuration changes in the related Service Access Information.

- When the *samplePercentage* property in a Metrics Reporting Configuration has a value of 100 percent, the metrics reporting entity shall activate the metrics reporting procedure for that configuration.
- If the *samplePercentage* value in a Metrics Reporting Configuration is less than 100 percent, the metrics reporting entity shall generate a random number which is uniformly distributed in the range of 0 to 100, and the metrics reporting entity shall activate the metrics reporting procedure for the Metrics Reporting Configuration when the generated random number is of a lower value than the *samplePercentage* value.

If the metrics reporting procedure is activated for a particular Client Metrics Reporting Configuration, the metrics reporting entity shall produce and submit a metrics report to the Media AF using the procedure specified in clause 5.3.5.2 when any of the following conditions are met:

- On determining the need to report ongoing QoE metrics for a media delivery session at periodic intervals determined by the *reportingInterval* property in the Client Metrics Reporting Configuration, provided that both of the following hold:
 - The time offset indicated in the *reportingStartOffset* property of the Client Metrics Reporting Configuration has passed since the start of the media delivery session; and
 - The time offset indicated in the *reportingDuration* property of the Client Metrics Reporting Configuration has not yet passed since the time offset indicated in the *reportingStartOffset* property.
- At the end of the media delivery session.

Whenever a metrics report is produced for a given client metrics reporting configuration, the metrics reporting entity shall reset its reporting interval timer for that configuration to the value of the *clientMetricsReportingConfigurations[].reportingInterval* property and it shall begin countdown of the timer again. When the media delivery session comes to an end, the metrics reporting entity shall disable its reporting interval timer for all client metrics reporting configurations.

Details of the APIs supporting these procedures at reference points M3 and M5 are specified in clause 9.5.

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.

5.3.5.2 Submit metrics report operation

This operation is used by the Media Session Handler or Media AS (whichever is acting as metrics reporting entity) to submit a metrics report to the Media AF. If several Media AF addresses are listed in the *serverAddresses* array of the client metrics reporting configuration (see table 9.2.3.1-1), the metrics reporting entity shall choose one at random and shall send the metrics report to the selected server endpoint. The HTTP POST method shall be used for this purpose, citing the address of the chosen Media AF in the request URL. The request body shall be formatted according to the metrics scheme indicated in *scheme* property of one of the Client Metrics Reporting Configurations (see clause 5.3.2.3 and table 9.2.3.1-1) and the *Content-Type* HTTP request header set accordingly. Details of individual metrics reporting schemes and their corresponding metrics report formats are beyond the scope of the present document, but the JSON-based metrics reporting envelope specified in clause 9.5.3.2 should be extended in preference when specifying new metrics report formats by adding new properties to the *MetricsSample* data type.

A reporting client identifier should be included in the metrics report if the metrics scheme supports carriage of this data. Metrics schemes designed for use with this operation should specify a means to convey a reporting client identifier. If available to the metrics reporting entity, its value should be a GPSI value as defined by TS 23.003 [16]. Otherwise, the reporting client identifier should be represented by a stable and globally unique string.

If the HTTP request is acceptable but the Media AF has not yet fully processed the submitted metrics report, the Media AF may return a *202 (Accepted)* HTTP response message with an empty body and process the report later.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* HTTP response message with an empty body to acknowledge successful processing of the metrics report.

If metrics reporting is not provisioned for the Provisioning Session in question, the Media AF shall return a *403 (Forbidden)* HTTP response message with an error message body per clause 7.1.7 and the Media AF shall not process the submitted report.

If the HTTP request message indicates a MIME content type in the *Content-Type* request header that is not consistent with one of the provisioned metrics reporting schemes, the Media AF shall return a *415 (Unsupported Media Type)* HTTP response message with an error message body per clause 7.1.7 and shall not process the submitted metrics report.

If the target Media AF endpoint is temporarily unable to accept the submitted metrics report (e.g. because it is overloaded), it shall return a *503 (Service Unavailable)* HTTP response message with an empty body. The optional HTTP response header *Retry-After* should be included in such a response, indicating when the Media AF expects to be able to accept new submissions. In this case, the metrics reporting entity should store outstanding metrics reports and reattempt submission when the endpoint later becomes available. Details are left to implementation.

5.3.6 Consumption reporting

5.3.6.1 Procedures

These procedures are used by the Media AS at reference point M3 or else by the Consumption Reporting functions of the Media Client and subsequently by the Media Session Handler at reference point M5 to submit a consumption report to one of the Media AF instances listed in the Client Consumption Reporting Configuration of the Service Access Information resource previously retrieved using the procedure in clause 5.3.2.3.

- When the Consumption Reporting feature is provisioned for downlink media delivery sessions using the operations specified in clause 5.2.12, a Client Consumption Reporting Configuration shall be provided to the Media Session Handler (acting in this case as consumption reporting entity) in the Service Access Information.

NOTE: The Consumption Reporting feature is not applicable to uplink media streaming.

- When the Consumption Reporting feature is provisioned for RTC sessions using the operations specified in clause 5.2.12, a Client Consumption Reporting Configuration shall be provided to the Media Session Handler and the Media AS (both acting in this case as consumption reporting entity) in the Service Access Information.

Furthermore:

- Before a media delivery session is started, the consumption reporting entity shall check if the Service Access Information includes a Client Consumption Reporting Configuration. If such a configuration is present, the consumption reporting entity shall initiate consumption reporting for the downlink media delivery session based on this configuration.

NOTE: The Client Consumption Reporting Configuration is absent in the case of uplink media streaming.

- During the course of the media delivery session, the consumption reporting entity shall periodically check if the Client Consumption Reporting Configuration has been added to or removed from the Service Access Information and shall activate or deactivate the consumption reporting procedure as appropriate for the media delivery session in question.

The data type of the Client Consumption Reporting Configuration signalled as part of the Service Access Information at reference point M5 is specified in clause 9.2.3.

The consumption reporting entity shall decide whether to activate the consumption reporting procedure for a particular media delivery session at the start of that session and whenever the Client Consumption Reporting Configuration changes in the related Service Access Information.

- When the *samplePercentage* property in the Client Consumption Reporting Configuration has a value of 100 percent, the consumption reporting entity shall activate the consumption reporting procedure.
- If the *samplePercentage* value in the Client Consumption Reporting Configuration is less than 100 percent, the consumption reporting entity shall generate a random number which is uniformly distributed in the range of 0 to 100, and the consumption reporting entity shall activate the consumption reporting procedure when the generated random number is of a lower value than the *samplePercentage* value.

If the consumption reporting procedure is activated, the consumption reporting entity shall produce and submit a consumption report to the Media AF using the procedure specified in clause 5.3.6.2 when any of the following conditions are met:

- At the start of consumption of a media item in a media delivery session.
- At the end of consumption of a media item in a media delivery session.
- On determining the need to report ongoing content consumption for a media delivery session at periodic intervals determined by the *reportingInterval* property in the Client Consumption Reporting Configuration.
- On detecting a location change during a media delivery session, if the *locationReporting* property in the Client Consumption Reporting Configuration is set to *true*.

NOTE: When the consumption reporting entity is a Media AS, it may be aware of changes to the location of a remote peer outside the Media Delivery System.

- On detecting a change of access network during a media delivery session, if the *accessReporting* property in the Client Consumption Reporting Configuration is set to *true*.

Whenever a consumption report is produced, the consumption reporting entity shall reset its consumption reporting interval timer to the value of the *reportingInterval* property of the Client Consumption Reporting Configuration and it shall begin countdown of the timer again. When the media delivery session comes to an end, the consumption reporting entity shall disable its consumption reporting interval timer.

Details of the APIs supporting these procedures at reference points M3 and M5 are specified in clause 9.6.

The consumption report shall comprise a time-ordered list of consumption reporting units. Each such unit shall describe the media selected for presentation during a continuous time period of a downlink media streaming session in terms of a start time and duration. The sequence of consumption reporting units shall be contiguous with no discontinuities in the reported timeline. When no media is being consumed (e.g., because the media streaming presentation is paused), the selected media shall still be indicated in the consumption reporting unit.

- A consumption reporting unit shall be included in exactly one consumption report, although delivery of this report may be attempted more than once by the consumption reporting entity.

- A new consumption reporting unit shall be created when the media consumed changes or (if provisioned in the consumption reporting configuration per clause 4.3.8) when the network used to access media at reference point M4d changes, including a change of network slice and/or Data Network.
- The last (or only) consumption reporting unit in every consumption report describes the media currently being consumed in the media streaming session and indicates in the duration property how long this media has been consumed so far.
- If there is no change in the media consumed when the next consumption report is sent to the Media AF, this consumption reporting unit shall be repeated as the first (and possibly only) consumption reporting unit in the next report with the same start time but with its duration updated to reflect the period of time that the media has been consumed up to the point of reporting.
- The last (or only) consumption reporting unit in the final consumption report sent to the Media AF at the end of the media streaming session therefore describes the last media consumed.

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.

5.3.6.2 Submit consumption report operation

This operation is used by the Media Session Handler or Media AS (whichever is acting as metrics reporting entity) to submit a consumption report to the Media AF. If several Media AF addresses are listed in the *serverAddresses* array of the Client Consumption Reporting Configuration (see table 9.2.3.1-1), the consumption reporting entity shall choose one at random and shall send the consumption report to the selected server endpoint. The HTTP POST method shall be used for this purpose, citing the address of the chosen Media AF in the request URL. The request body shall be a *ConsumptionReport* structure, as specified in clause 9.6.3.1.

A reporting client identifier shall be included in the consumption report. If available to the consumption reporting entity, its value should be a GPSI value as defined by TS 23.003 [16]. Otherwise, the reporting client identifier should be represented by a stable and globally unique string.

The location(s) of the UE (or remote peer outside the Media Delivery System) when the media was consumed shall be included in every *ConsumptionReportingUnit* (see clause 9.6.3.2) if the *locationReporting* property in the Client Consumption Reporting Configuration is set to *true*.

If the HTTP request is acceptable but the Media AF has not yet fully processed the submitted consumption report, the Media AF may return a *202 (Accepted)* HTTP response message with an empty body and process the report later.

If the operation is otherwise successful, the Media AF shall return a *200 (OK)* HTTP response message with an empty body to acknowledge successful processing of the consumption report.

If consumption reporting is not provisioned for the Provisioning Session in question, the Media AF shall return a *403 (Forbidden)* HTTP response message with an error message body per clause 7.1.7 and the Media AF shall not process the submitted consumption report.

If the target Media AF endpoint is temporarily unable to accept the submitted consumption report (e.g. because it is overloaded), it shall return a *503 (Service Unavailable)* HTTP response message with an empty body. The optional HTTP response header *Retry-After* should be included in such a response, indicating when the Media AF expects to be able to accept new submissions. In this case, the consumption reporting entity should store outstanding consumption reports and reattempt submission when the endpoint subsequently becomes available. Details are left to implementation.

5.4 UE media session handling (M6, M11) interactions

5.4.1 Overview

This clause specifies the interactions between the Media-aware Application and the Media Session Handler at reference point M6 and those between the Media Access Function and the Media Session Handler at reference point M11. Details are provided in clause 11.

5.4.2 Media delivery session life-cycle

5.4.2.1 Explicit media session handling initiation/termination

Media session handling of a new media delivery session may be explicitly initiated by a Media-aware Application or Media Access Function by invoking an appropriate API method on the Media Session Handler at reference points M6 or M11, respectively.

- An *external service identifier* shall be provided as input parameter to the API method.
- A Media Entry Point URL, for instance obtained from the Media Application Provider at reference point M8, may optionally be provided as an input parameter in order to initiate media delivery.

In response, the Media Session Handler shall allocate a globally unique *media delivery session identifier* for use by the Media Client in its subsequent interactions with the Media AF and Media AS.

If it does not already have a fresh copy cached, the Media Session Handler shall attempt to acquire full Service Access Information for the specified external service identifier from the Media AF using the operation defined in clause 5.3.2.3 and, if successful, shall return the media delivery session identifier to the invoker of the API method.

If invoked by a Media-aware Application at reference point M6, the Media Session Handler shall initialise a new Media Access Function instance on behalf of the invoker, and shall initiate media delivery by passing it the Media Entry Point URL.

Subsequent interactions between the Media-aware Application and the Media Session Handler at reference point M6 shall cite the relevant media delivery session identifier.

Subsequent interactions between the Media-aware Application and the Media Access Function at reference point M7 shall cite the relevant media delivery session identifier.

Subsequent interactions between the Media Session Handler and the Media Access Function at reference point M11 shall cite the relevant media delivery session identifier.

Subsequent interactions by the Media Access Client with the Media AS at reference point M4 shall cite the relevant media delivery session identifier to enable media access logged by the Media AS to be correlated with media session handling operations logged by the Media AF.

The Media-aware Application or Media Access Function may explicitly terminate media session handling of the media delivery session by invoking an appropriate API method on the Media Session Handler at reference point M6 or M11, respectively, citing the target media delivery session identifier as input parameter.

5.4.2.2 Implicit media session handling initiation/termination

A UE entity may use the implicit service launch mechanism specified in clause 6 to initiate media session handling of a new media delivery session.

In response, the Media Session Handler shall allocate a globally unique *media delivery session identifier* for use by the Media Client in its subsequent interactions with the Media AF and Media AS.

The Media Session Handler shall attempt to acquire full Service Access Information for the specified external service identifier from the Media AF using the operation defined in clause 5.3.2.3.

The implicit service launch mechanism does not typically yield a return value, in which case it is not possible to return a media delivery session identifier to the invoker. Hence, it is not possible for the UE entity invoking the implicit service launch mechanism to take advantage of the UE media session handling APIs specified in clause 10. Nevertheless, the Media Session Handler is able to support a limited subset of media session handling on behalf of the UE entity – such as dynamic policy instantiation based on a Service Operation Point – if additional launch parameters are embedded in the Service URL.

When it has been initiated using the implicit method described in this clause, the media delivery session is implicitly terminated by the Media Session Handler after it detects an implementation-specific period of inactivity.

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 Handler 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 Handler 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.

5.4.4 Network Assistance invocation

At the start of a media delivery session, the Media Access Function shall determine an initial bit rate recommendation by invoking an appropriate API method on the Media Session Handler at reference point M11. The Media Session Handler shall invoke the operation specified in clause 5.3.4.2 to create a new Network Assistance Session and shall return to the Media Access Function the bit rate recommendation information in the response from the Media AF. The Media Access Function may use this information to set an initial bit rate for the media delivery session (e.g., by selecting an initial MPEG-DASH Representation or contribution media encoding bit rate). The Media Access Function may also use this bit rate recommendation to select a different Service Operation Point, resulting in a change to the current Dynamic Policy (see clause 5.4.2).

The Media Session Handler shall subscribe to receive notifications from the Media AF at reference point M11 of bit rate recommendation updates. When such an update is received from the Media AF, the Media Session Handler shall send a notification to the Media Access Function at reference point M11 providing the new bit rate recommendation. As a result, the Media Access Function may modify the bit rate of the media delivery session (e.g., by switching to a different MPEG-DASH Representation or by varying the rate controller of a contribution media encoder). The Media Access Function may also use this bit rate recommendation to select a different Service Operation Point, resulting in a change to the current Dynamic Policy (see clause 5.4.2).

During the course of the media delivery session the Media Access Function may request a delivery boost by invoking an appropriate API method on the Media Session Handler at reference point M11 (see clause 11.4.1.2).

5.4.5 Metrics reporting

When metrics reporting is active for a given media delivery session, the Media Session Handler shall periodically sample the metrics required by the metrics scheme(s) configured per clause 5.3.5.1 by invoking an appropriate API method at reference point M11 on the Media Access Function and shall use these to populate metrics reports.

5.4.6 Consumption reporting

When consumption reporting is active for a given media delivery session, the Media Session Handler shall periodically determine the consumption reporting parameters required per clause 5.3.6.1 by invoking an appropriate API method on the Media Access Function at reference point M11 and shall use these to populate consumption reports.

5.5 5GC policy control (N5/N33) interactions

5.5.1 Overview

Certain features of the Media Delivery System rely on interfaces and APIs that are defined in the 5G Core. The interactions between the Media AF and the Network Functions in the 5GC to support these features are specified in the following clauses.

NOTE: The Media Delivery System architecture may be applied to an EPS although such application is not specified in the present document and is left to the discretion of deployments and implementations.

Illustrative mappings from the Media AF resources and data structures specified in the present document to equivalent resources and data structures in the PCF and NEF are provided in annex D.

5.5.2 Policy control interactions for Policy Template provisioning

When a Policy Template is provisioned that specifies a new Background Data Transfer policy by including the *bdtSpecification* property, the Media AF shall invoke the *Npcf_BDTPolicyControl_Create* operation as specified in clause 4.2.2 of TS 29.554 [46] to create a separate Background Data Transfer policy in the PCF for each time window occurrence.

- The properties of the *bdtReqData* object shall be populated from the time window information in the *BdtPolicySchedule* as follows:
 - *desTimeInt* shall be populated from *startTime* on the occurrence date and the *duration*.
 - *numOfUes* shall be populated from *numberOfUes*.
 - *volPerUe* shall be populated from *estimatedDataVolumePerUe*.
- The properties of the *bdtPolData* object shall be populated from the time window information in the *BdtPolicySchedule* as follows:
 - *transfPolicies[].recTimeInt* shall be populated from *startTime* on the occurrence date and the *duration*.
 - *transfPolicies[].maxBitRateDL* shall be populated from *aggregatedDownlinkBitRateLimit*, if present.
 - *transfPolicies[].maxBitRateUL* shall be populated from *aggregatedUplinkBitRateLimit*, if present.

The Media AF is responsible for allocating downlink and uplink bit rates within the provisioned limits of the Background Data Transfer policy when a Policy Template with a Background Data Transfer specification is instantiated by the Media Client, such that the aggregate maximum bit rates (if any) are not exceeded at any point of time. How the Media AF polices this limit is out of scope of the present document.

The Media AF may use the values of the *numberOfUes* and *estimatedDataVolumePerUe* properties to estimate the total aggregate data volume that may be transferred by all Media Clients in a given time window.

When a Policy Template that specifies a Background Data Transfer policy by including the *bdtSpecification* property is destroyed, there is no operation specified by the *Npcf_BDTPolicyControl* service in TS 29.554 [46] to destroy the corresponding Background Data Transfer policy in the PCF.

5.5.3 Policy control interactions for Dynamic Policies

5.5.3.1 General

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 at reference point N33) 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. Example mappings are provided in annex D.

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 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.

5.5.3.2 Mapping of Background Data Transfer parameters

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.

Where 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.

5.5.3.3 Mapping of application-specific PDU handling parameters

5.5.3.3.1 Mapping of media transport parameters to Protocol Description

When the Media AF directly invokes the *Npcf_PolicyAuthorization* service at reference point N5 according to TS 29.514 [18] and the *ApplicationFlowDescription.mediaTransportParameters* property of an *ApplicationFlowBinding* object is populated, then the *MediaComponent* object in the PCF at reference point N5 associated with the *ApplicationFlowBinding* shall be populated as follows by the Media AF to enable traffic detection by the 5G Core for application-specific PDU handling based on parameters present in the media transport at reference point M4 or M12:

- The *MediaComponent.protoDescDI* property shall be set to the values of the *ApplicationFlowDescription.mediaTransportParameters* object if the *ClientQosSpecification.desiredDownlinkPduSetQosParameters* property is present in the corresponding *ApplicationFlowBinding*.
- The *MediaComponent.protoDescUI* property shall be set to the values of the *ApplicationFlowDescription.mediaTransportParameters* object if the *ClientQosSpecification.desiredUplinkPduSetQosParameters* property is present in the corresponding *ApplicationFlowBinding*.

When the Media AF invokes the *Nnef_AFsessionWithQoS* service at reference point N33 according to TS 29.522 [19] and TS 29.122 [20] and the *ApplicationFlowDescription.mediaTransportParameters* property of an *ApplicationFlowBinding* object is populated, then the *AsSessionMediaComponent* object in the NEF at reference point N33 associated with the *ApplicationFlowBinding* shall be populated as follows by the Media AF to enable traffic detection by the 5G Core for application-specific PDU handling based on parameters present in the media transport at reference point M4 or M12:

- The *AsSessionMediaComponent.protoDescDI* property shall be set to the values of the *ApplicationFlowDescription.mediaTransportParameters* object if the *ClientQosSpecification.desiredDownlinkPduSetQosParameters* property is present in the corresponding *ApplicationFlowBinding*.
- The *AsSessionMediaComponent.protoDescUI* property shall be set to the values of the *ApplicationFlowDescription.mediaTransportParameters* object if the *ClientQosSpecification.desiredUplinkPduSetQosParameters* property is present in the corresponding *ApplicationFlowBinding*.

5.5.3.3.2 Mapping of PDU Set QoS parameters

When the Media AF directly invokes the *Npcf_PolicyAuthorization* service at reference point N5 according to TS 29.514 [18], the following conditions apply:

- If the *pduSetQoSLimits* property is populated in *PolicyConstraints.downlinkQoSSpecification*, then the *MediaComponent.pduSetQoSDownlink* 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.pduSetQoSDownlink* object shall be populated directly from the *desiredDownlinkPduSetQoSParameters* object.
- If the *pduSetQoSLimits* property is populated in *PolicyConstraints.uplinkQoSSpecification*, then the *MediaComponent.pduSetQoSUplink* 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.pduSetQoSUplink* object shall be populated directly from the *desiredUplinkPduSetQoSParameters* object.

When the Media AF invokes the *Nnef_AFsessionWithQoS* service at reference point N33 according to TS 29.522 [19] and TS 29.122 [20], the following conditions apply:

- If the *pduSetQoSLimits* property is populated in *PolicyConstraints.downlinkQoSSpecification*, then the *AsSessionMediaComponent.pduSetQoSDownlink* 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 *AsSessionMediaComponent.pduSetQoSDownlink* object shall be populated directly from the *desiredDownlinkPduSetQoSParameters* object.
- If the *pduSetQoSLimits* property is populated in *PolicyConstraints.uplinkQoSSpecification*, then the *AsSessionMediaComponent.pduSetQoSUplink* 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 *AsSessionMediaComponent.pduSetQosUI* object shall be populated directly from the *desiredUplinkPduSetQosParameters* object.

5.5.3.3.3 Mapping of dynamic traffic characteristics parameters

NOTE: Handling of dynamically changing traffic characteristics by the 5G Core at reference point M12 is for future study.

When the Media AF directly invokes the *Npcf_PolicyAuthorization* service at reference point N5 according to TS 29.514 [18], the *MediaComponent* object in the PCF at reference point N5 associated with the *ApplicationFlowBinding* shall be populated as follows by the Media AF to enable downlink dynamic traffic characteristics detection by the 5G Core based on PDU markings present in the media transport at reference point M4 only:

- If the *downlinkDataBurstSizeMarkingRequired* property is present and *true* in the operative member of the Policy Template's *qosSpecifications* array, then the *MediaComponent.datBurstSizeInd* property shall be populated by the Media AF at reference point N5 with the same value.
- If the *downlinkTimeToNextBurstMarkingRequired* property is present and *true* in the operative member of the Policy Template's *qosSpecifications* array, then the *MediaComponent.timetoNextBurstInd* property shall be populated by the Media AF at reference point N5 with the same value.
- If the *downlinkExpeditedTransferIndicationRequired* property is present and *true* in the operative member of the Policy Template's *qosSpecifications* array, and the *downlinkExpeditedTransferIndication* is present in an *ApplicationFlowBinding.qosSpecification* object of a *DynamicPolicy* resource instantiating the Policy Template, then for a corresponding *MediaComponent* at reference point N5, the *MediaComponent.expTranInd* property shall be populated by the Media AF at reference point N5 with the same value as the *downlinkExpeditedTransferIndication*.

When the Media AF invokes the *Nnef_AFsessionWithQoS* service at reference point N33 according to TS 29.522 [19] and TS 29.122 [20], the *AsSessionWithQoSSubscription* resource at reference point N33 shall be populated as follows by the Media AF to enable downlink dynamic traffic characteristics detection by the 5G Core based on PDU markings present in the media transport at reference point M4 only:

- If the *downlinkDataBurstSizeMarkingRequired* property is present and *true* in the operative member of the Policy Template's *qosSpecifications* array, then the *AsSessionWithQoSSubscription.datBurstSizeInd* property shall be populated by the Media AF at reference point N33 with the same value.
- If the *downlinkTimeToNextBurstMarkingRequired* property is present and *true* in the operative member of the Policy Template's *qosSpecifications* array, then the *AsSessionWithQoSSubscription.timetoNextBurstInd* property shall be populated by the Media AF at reference point N33 with the same value.
- If the *downlinkExpeditedTransferIndicationRequired* is present and *true* in the operative member of the Policy Template's *qosSpecifications* array, and the *downlinkExpeditedTransferIndication* is present in an *ApplicationFlowBinding.qosSpecification* object of a *DynamicPolicy* resource instantiating the Policy Template, then for a corresponding *AsSessionWithQoSSubscription* at reference point N33, the *AsSessionWithQoSSubscription.expTranInd* property shall be populated by the Media AF at reference point N33 with the same value as the *downlinkExpeditedTransferIndication*.

5.5.3.3.4 Mapping of multiplexed media flow information

When the Media AF directly invokes the *Npcf_PolicyAuthorization* service at reference point N5 according to TS 29.514 [18], the *MediaComponent* object in the PCF at reference point N5 associated with the *ApplicationFlowBinding* shall be populated as follows by the Media AF to enable multiplexed media traffic identification by the 5G Core based on media identification information present in the media transport at reference point M4 or M12:

- When *ApplicationFlowDescription.uplinkMultiplexedMediaInfos* and/or *ApplicationFlowDescription.downlinkMultiplexedMediaInfos* properties are present for an application data flow, the *MediaComponent.medSubComps* array shall include a *MediaSubComponent* object describing each media stream of the application data flow at reference point N5. The *MediaSubComponent* of a media flow shall be populated as follows:
 - The *marBwDI* and *marBwUI* properties shall be set to the maximum requested bit rate for this media flow in the downlink and uplink directions respectively.

- The *mpxMediaUInfos* array shall be populated with a copy of the corresponding *MpxMediaInfo* objects provided in *ApplicationFlowDescription.uplinkMultiplexedMediaInfos*.
- The *mpxMediaDInfos* array shall be populated with a copy of the corresponding *MpxMediaInfo* objects provided in *ApplicationFlowDescription.downlinkMultiplexedMediaInfos*.

When the Media AF invokes the *Nnef_AFsessionWithQoS* service at reference point N33 according to TS 29.522 [19] and TS 29.122 [20], the *multiModDatFlows* property of *AsSessionWithQoSSubscription* resource at reference point N33 shall be populated as follows by the Media AF to enable multiplexed media traffic identification by the 5G Core based on media identification information present in the media transport at reference point M4 or M12:

- When *ApplicationFlowDescription.uplinkmultiplexedMediaInfos* and/or *ApplicationFlowDescription.downlinkmultiplexedMediaInfos* properties are present for an application data flow, a separate *AsSessionMediaComponent* object shall be used to describe each media stream of the application data flow at reference point N33 and this object shall be populated as follows:
 - The *marBwDI* and *marBwUI* properties shall be set to the maximum requested bit rate for the media flow in the downlink and uplink directions respectively.
 - The *flowInfos* array shall include a single *FlowInfo* object describing the media flow that shall be populated as follows:
 - The *mpxMediaUInfos* array shall be populated with a copy of the corresponding *MpxMediaInfo* objects provided in *ApplicationFlowDescription.uplinkmultiplexedMediaInfos*.
 - The *mpxMediaDInfos* array shall be populated with a copy of the corresponding *MpxMediaInfo* objects provided in *ApplicationFlowDescription.downlinkmultiplexedMediaInfos*.

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 *I4SEnablementPreference* 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 a *qoSMonitoringConfiguration* 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 [52]:

- 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].

5.5.4 Policy control interactions for AF-based Network Assistance

The AF-based Network Assistance feature operates at reference point M5 between the Media Session Handler in the Media Client and a Media AF that provides Network Assistance capabilities. The Network Assistance API at reference point M5 (see clauses 5.3.4 and 9.4) is specified in a generic way such that the associated Network Assistance 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 obtaining Network Assistance information.

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

If it supports the Network Assistance feature, the Media AF shall offer the bit rate recommendation (throughput estimation) and delivery boost request API based on existing Policy Templates that match the filtering criteria for a media streaming session, and 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* service exposed by the NEF, as specified in clause 4.4.9 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.

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 Network Assistance Session is created by the Media Session Handler for a particular media delivery session (per clause 5.3.4.2), the Media AF shall create an *AF application session context* in the PCF responsible for the PDU Session corresponding to the M4 application flow indicated in the *NetworkAssistanceSession.applicationFlowDescription* property.

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 Network Assistance Session resource, as well as from the referenced Policy Template (if any) 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.

The *MediaComponent.pduSetQoSDI* object shall not be populated by the Media AF

The *MediaComponent.pduSetQoSUI* object shall not be populated by the Media AF

For each of the Network Assistance Sessions 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.

When requesting QoS provisioning for a Network Assistance Session, the Media AF shall use the configured Policy Templates of the Provisioning Session 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 a Network Assistance session is subsequently destroyed by the Media Session Handler (per clauses 5.3.4.7 and 11.6.4.6), the Media AF shall destroy the corresponding AF application session context in the relevant PCF instance.

5.6 UE modem interactions

5.6.1 Overview

Certain features of the Media Delivery System rely on interfaces and APIs that are essentially UE-internal. The interactions between the Media Session Handler and the UE modem to support these features are specified in the following clauses.

5.6.2 ANBR-based Network Assistance

If ANBR-based Network Assistance is supported, the Media Session Handler may use an interface to the Medium Access Control entity in the UE modem to send and receive bit rate recommendation messages. This interface may be based on the AT commands *+CGBRRREQ* and *+CGBRRREP* as defined in TS 27.007 [21].

Furthermore, messaging across that interface corresponds to the logical translations of the *Bit Rate Recommendation* and/or *Bit Rate Recommendation Query* messages, carried by the Recommended bit rate MAC CE, exchanged between the RAN Modem and the RAN, as specified in TS 38.321 [22] for 5G NR and TS 36.321 [22] for LTE. The association between the LCID for which the recommendation applies and the actual flow (including the intermediate RLC channel) is performed by the modem.

NOTE: The AT command *+C5GQOSRDP=?* may be used to obtain a list of CID values that are associated with QoS flows (both network and MT/TE initiated). When used to request a bit rate boost, the query shall not request a bit rate that may exceed the MBBR for the corresponding QoS Flow. Failure to ensure this may result in unexpected congestion-induced packet delays and packet dropping.

The *Bit Rate Recommendation Query* shall indicate the bit rate desired by the application, as described by [22] and [23]. This request may be used by the Media Session Handler to request for a temporary increase in bit rate for the corresponding flow ("delivery boost"). The RAN responds with a Bit Rate Recommendation message that confirms the recommended bit rate after the boost grant. Once the bit rate drops again after a boost grant, the network shall inform the Media Session Handler about the new recommended bit rate by means of an ANBR message.

Whenever the Media Session Handler receives a message from the UE modem corresponding to the logical translation of the *Bit Rate Recommendation* message for the associated RAN uplink or downlink, it shall notify the Media Access Function (via a suitable reference point M11 notification – see table 11.4.2-2) of the new bit rate recommendation associated with the indicated PDU session.

Furthermore, whenever the Media Session Handler receives a request for a delivery boost from the Media Access Function (via a suitable reference point M11 method invocation – see clause 11.4.1.2) relating to a PDU session in use for Media Delivery, it may send a delivery boost message to the UE modem. That delivery boost request is logically translated by the modem to the *Bit Rate Recommendation Query* message which is then sent to the RAN on the associated RAN uplink or downlink.

It is left to the implementer of the Media Access Function to decide how to best use the bit rate recommendation and the bit rate recommendation query information for individual media delivery sessions.

5.6.3 RAN-based metrics reporting

These procedures shall be used by the Media Session Handler to control metrics reporting when such reporting is configured by the OAM via the 5G control plane signalling.

As described in clause L.1 of TS 26.247 [8], the metrics configuration is delivered to the UE as a container from the OAM via RAN and the Media Session Handler should obtain its metrics configuration, e.g. using the AT Command `+CAPPLEVMC` or `+CAPPLEVMCNR`. This configuration may also include virtual reality metrics as specified in clause 9.3 of TS 26.118 [9]. When a metrics configuration is received, the Media Session Handler shall store this configuration and use it for all subsequent media delivery sessions.

When a media delivery session is started the Media Session Handler shall determine whether metrics from this session shall be reported. The determination shall be based on the *sample percentage*, *slice scope* and *streaming source filter* specified in the stored metrics configuration, according to clause 10.5 of TS 26.247 [8].

If metrics are to be reported for the session, the Media Session Handler shall request the Media Access Function to create a metrics collection job. The Media Access Function shall return a reference to the created job, which the Media Session Handler shall use in all subsequent actions related to this job.

The Media Session Handler shall configure the metrics collection job with the set of metrics to be collected during the media delivery session. The format of the configuration shall be according to clause L.2 of [8], but only the *metrics* attribute in the configuration shall be used for this purpose.

The Media Session Handler shall regularly request the collected metrics from the Media Access Function according to the *reportingInterval* specified in the metrics configuration. The metrics returned by the Media Access Function shall use the format as described in clause 10.6 of [8], and (for Virtual Reality media) in clause 9.4.3 of TS 26.118 [9]. The Media Session Handler should forward these to the UE modem, e.g. using the AT command `+CAPPLEVMR` or `+CAPPLEVMRNR`. As a result, the UE modem sends metrics reports to the RAN which are then forwarded to the OAM according to clause L.1 of [8].

When the media delivery session is finished the Media Session Handler shall destroy the metrics collection job.

6 3GPP Service URL

6.1 General

This clause defines the syntax for 3GPP Service URLs used to launch media delivery sessions and the associated URL handling.

The 3GPP Service URL may be provided to the application via reference point M8 if it is a Media-aware Application. In another variant, the application may generate a 3GPP Service URL based on information in its own configuration.

6.2 3GPP Service URL syntax

3GPP Service URLs used to initiate media delivery sessions shall take the following form:

```
http[s]://launch.3gppservices.org/{service}/{service_id}?{query_parameters}][#{fragment}]
```

The structure of the 3GPP Service URL is as follows:

- The *prefix part* starts with the scheme name `http:` or `https:` followed by a double-slash `//`, followed by the authority `launch.3gppservices.org`, followed by a service type discriminator path segment *service*, followed by a service identifier path segment *service_id* and optional further path segments. This is aligned with section 4.2 of RFC 9110 [24] with the restriction that the prefix part shall not contain the character `"&"` unless appropriately escaped.
- The *suffix part* is optional and consists of the character `"?"` followed by a *query part* specifying additional service launch parameters formatted as a set of `<key>=<value>` pairs or flags that do not contain the equals character `"="` and, optionally, followed by a *fragment part*. The suffix part is terminated by the end of the URL.

The formal ABNF of the 3GPP Service URL, following the generic syntax of URIs specified in RFC 3986 [35] is specified in listing 6.2.1-1:

Listing 6.2-1: ABNF syntax of 3GPP Service URL for Media Delivery session launch

```

service-URI = scheme ":" hier-part [ "?" query ] [ "#" fragment ]
scheme      = "http:" / "https:"
hier-part   = "://" 3gpp-domain "/" service [/ service_id] path-abempty
3gpp-domain = "launch.3gppservices.org"
service     = service-label / "generic"
service-label = 1*uchar
service_id  = 1*uchar
path-abempty = <path-abempty, see RFC3986 [35], section 3.3>
query       = <query, see RFC3986 [35], section 3.4>
fragment    = <fragment, see RFC3986 [35], section 3.5>

```

6.3 Handling of 3GPP Service URLs by Media Client

Requests for 3GPP Service URLs from Media-aware Applications shall be handled by the Media Session Handler at reference point M6.

Requests for 3GPP Service URLs from other applications shall be handled by the Media Session Handler.

To cater for cases where a Media Session Handler is not present in a UE, the network shall provide a resolution of the 3GPP Service URL, for example to a service endpoint provided by the Media AF, that provides the invoking application with a resource that it is able to process, for example a media file, the URL of an MPD, etc. If this resolution yields a new URL, the service endpoint shall respond with an HTTP redirect to this new URL; otherwise, an appropriate HTTP error response shall be returned.

The Media Session Handler performs decomposition of the URI into the prefix and suffix. The following handling applies:

- If the URI handed to the Media Session Handler does not conform to a 3GPP Service URL, the Media Session Handler should return a proper error response to the invoking application.
- If the Media Session Handler does not support the service type discriminator *service* indicated in the prefix part, it should return a proper error response to the invoking application.
- Specific additional operations may be defined for each service.

7 General aspects of network APIs

7.1 Usage of HTTP

7.1.1 HTTP protocol version

Implementations of the Media AF shall expose both HTTP/1.1 [26] and HTTP/2 [27] endpoints at reference points M1, M3 and M5, including support for the HTTP/2 starting mechanisms specified in section 3 of RFC 9113 [27]. In both protocol versions, TLS version 1.3 [29] shall be supported and HTTPS interactions should be used on these interfaces in preference to cleartext HTTP.

- The Media Application Provider may use any supported HTTP protocol version at reference point M1.
- The Media AS may use any supported HTTP protocol version at reference point M3.
- The Media Session Handler may use any supported HTTP protocol version at reference point M5.

All responses from the Media AF that carry a message body shall provide a strong entity tag in the form of an ETag response header and a modification timestamp in the form of a Last-Modified response header.

All endpoints exposed at reference points M1, M3 and M5 shall support the conditional HTTP requests *If-None-Match* and *If-Modified-Since*.

7.1.2 HTTP endpoint addresses

7.1.2.1 Default Media AF endpoint address at reference point M1

The present document does not specify a default endpoint address for the *Maf_Provisioning* service exposed to the Media Application Provider at reference point M1.

7.1.2.2 Default Media AF endpoint address at reference point M3

The present document does not specify a default endpoint address for the *Maf_SessionHandling* service exposed to the Media AS at reference point M3.

7.1.2.3 Default Media AF endpoint address at reference point M5

The present document does not specify a default endpoint address for the *Maf_SessionHandling* service exposed to the Media Session Handler at reference point M5.

7.1.3 HTTP resource URIs and paths

The resource URI used in each HTTP request to the API provider shall have the structure defined in clause 4.4.1 of TS 29.501 [31], i.e.:

{apiRoot}/{apiName}/{apiVersion}/{apiSpecificResourceUriPart}

with the following components:

- *{apiRoot}* shall be set as described in [31].
- *{apiName}* shall be set as defined by the following clauses.
- *{apiVersion}* shall be set to "v1" in this release of the specification.
- *{apiSpecificResourceUriPart}* shall be set as described in the following clauses.

7.1.4 Usage of HTTP headers

7.1.4.1 General

Standard HTTP headers shall be used in accordance with clause 5.2.2 of TS 29.500 [30] for both HTTP/1.1 [26] and HTTP/2 [27] messages.

7.1.4.2 User Agent identification

Individual specifications referencing the present document shall specify the *User-Agent* HTTP request header used by the Media Session Handler to identify itself.

7.1.4.3 Server identification

Individual specifications referencing the present document shall specify the *Server* HTTP response header used by the Media AF to identify itself.

7.1.4.2 Cache control

All responses from the Media AF that carry a resource message body shall include:

- a strong entity tag for the resource, conveyed in an **ETag** response header as specified in section 8.8.3 of RFC 9110 [24],
- a resource modification timestamp, conveyed in a **Last-Modified** response header as specified in section 8.8.2 of [24], and
- a predicted time-to-live period for the resource, conveyed in a **Cache-Control: max-age** response header as specified in section 5.2.1.1 of RFC 9111 [25].

7.1.4.3 Support for conditional HTTP GET requests

All API endpoints on the Media AF that expose the HTTP GET method shall support conditional requests using the **If-None-Match** and **If-Modified-Since** request headers as specified in section 13 of [24]. API clients should not attempt to revalidate their cached copy of a resource using a conditional GET request before the indicated time-to-live period has elapsed.

7.1.4.4 Support for conditional HTTP POST, PUT, PATCH and DELETE requests

All API endpoints on the Media AF that expose the HTTP POST, PUT, PATCH or DELETE methods shall support conditional requests using the **If-Match** request header as specified in section 13.1.1 of RFC 9110 [24]. The API client should supply a strong entity tag previously obtained per clause 7.1.4.2 in this request header when invoking any of these HTTP methods.

7.1.5 HTTP message bodies for API resources

The OpenAPI [32] specification of request and response HTTP messages is contained in annex A.

7.1.6 HTTP response codes

Guidelines for error responses to the invocation of APIs of NF services are specified in clause 4.8 of TS 29.501 [31]. API-specific error responses are specified in the respective clauses of the present document.

7.1.7 HTTP error response message bodies

Error messages shall be conveyed to the API client using an HTTP response body of type *ProblemDetails*, as specified in clause 4.8.2 of TS 29.501 [31].

7.2 Explanation of API data model notation

The data models in the following API clauses are specified using the following notational conventions:

1. Data models are expressed as an unordered list of JSON properties [37] with one property defined in each row of the data model table.
2. The *Data type* column defines the type of the property, according to JSON [37].
3. The keyword "Array" in the *Data type* column indicates that zero or more elements of the data type in brackets are included. The number of elements in the array may additionally be constrained by normative text in the *Description* column.
4. The *Cardinality* column defines whether a property is optional or mandatory. An array with cardinality 0 indicates that the array property is optional in the data structure. An array with cardinality 1 indicates that the property is mandatory in the data structure, even when the array is empty.
5. The keyword "Object" in the *Data type* column indicates a structured sub-object of an unnamed type whose properties are defined inline in the indented table rows immediately afterwards. The "Object" type may be combined with the "Array" type.
6. In the case of data types specifying RESTful resources, the additional *Usage* column defines the property behaviour for each CRUD Operation as follows:
 - "C" (Create), "R" (Retrieve) and "U" (Update) refers to the CRUD procedure during which the property is present in the resource type. (A Destroy operation never takes any input data type in the body of the request message, nor does it return any response message body.)
 - "RO" signifies a read-only property. Only the API provider function is permitted to modify the property value. Any value supplied by the API invoker in the body of a request message is ignored by the API provider function. The property may be omitted from request message bodies, even if it is a mandatory property of the data type, i.e., the property is only mandatory in response message bodies.
 - "WO" signifies a write-only property. Only the API invoker is permitted to modify the property value. The API provider function should not populate this property in the body of any response message returned to the API invoker, even if it is a mandatory property of the data type, i.e., the property is only mandatory in request message bodies.
 - "RW" signifies a read/write property. The API provider and API invoker may both modify the property value.
7. An additional read-only property is included at the start of all data models defining resources that are members of a RESTful collection. This property is populated with the unique identifier of the resource within its parent collection, and corresponds to the leaf path element in the RESTful URL of that resource.

7.3 Common OpenAPI data types

7.3.1 General

The data types defined in this clause are intended to be used by more than one of the Media Delivery APIs.

7.3.2 Simple data types

Table 7.3.2-1 below specifies common simple data types used within the Media Delivery APIs, including a short description of each. In cases where types from other specifications are reused, a reference is provided.

Table 7.3.2-1: Simple data types

Type name	Type definition	Description	Reference
<i>Uint6</i>	integer	Integer where the allowed values correspond to the value range of an unsigned 6-bit integer.	Clause A.2
<i>Uint8</i>	integer	Integer where the allowed values correspond to the value range of an unsigned 8-bit integer.	Clause A.2
<i>Uint20</i>	integer	Integer where the allowed values correspond to the value range of an unsigned 20-bit integer.	Clause A.2
<i>ResourceId</i>	string	String chosen by the Media AF to serve as an identifier in a resource URL.	Clause A.2.
<i>Percentage</i>	number	A percentage expressed as a floating-point value between 0.0 and 100.0 (inclusive).	Clause A.2.
<i>DurationSec</i>	integer	An unsigned integer identifying a period of time expressed in units of seconds.	TS 29.571 [33] table 5.2.2-1
<i>Duration</i>	string	A period of time expressed as a string compliant with the <i>duration</i> format specified in section 7.3.1 of the JSON Schema specification [38].	Clause A.2. IETF RFC 3339 [34] appendix A.
<i>Date</i>	string	An absolute date expressed using the OpenAPI <i>date</i> string format.	TS 29.571 [12] table 5.2.2 1
<i>DateTime</i>	string	An absolute date and time expressed using the OpenAPI <i>date-time</i> string format.	TS 29.571 [33] table 5.2.2-1
<i>Uri</i>	string	Uniform Resource Identifier conforming with the <i>URI-reference</i> production of the URI Generic Syntax.	TS 29.571 [33] table 5.2.2-1
<i>Url</i>	string	Uniform Resource Locator, conforming with the URI Generic Syntax.	RFC 3986 [41] section 4.1
<i>RelativeUrl</i>	string	Relative Uniform Resource Locator, conforming with the <i>relative-ref</i> production of the URI Generic Syntax. Both <i>query</i> and <i>fragment</i> suffixes are permitted.	RFC 3986 [35], section 4.2
<i>AbsoluteUrl</i>	string	Absolute Uniform Resource Locator, conforming with the <i>absolute-URI</i> production of the URI Generic Syntax in which the scheme part is <i>http</i> or <i>https</i> . The <i>query</i> suffix is permitted but the <i>fragment</i> suffix is not.	RFC 3986 [35], section 4.3
<i>IPv4Addr</i>	string	IPv4 address formatted in "dotted decimal" notation	TS 29.571 [33] table 5.2.2-1.
<i>IPv6Addr</i>	string	IPv6 address formatted in colon-separated hexadecimal quartet notation.	TS 29.571 [33] table 5.2.2-1.
<i>UInteger</i>	integer	Unsigned integer.	TS 29.571 [33] table 5.2.2-1.
<i>UIntegerRm</i>	integer	Unsigned integer (nullable).	TS 29.571 [33] table 5.2.2-1.
<i>Uint32</i>	integer	Unsigned integer between 0 and 4294967295 ($2^{32} - 1$).	TS 29.571 [33] table 5.2.2-1.
<i>Dnn</i>	string	Data Network Name.	TS 29.571 [33] table 5.3.2-1.
<i>BitRate</i>	string	A bit rate expressed as a string-encoded decimal value and unit.	TS 29.571 [33] table 5.5.2-1.
<i>PacketLoss Rate</i>	integer	An integer between 0 and 1000 encoding tenths of a percent	TS 29.571 [33] table 5.5.2-1.
<i>MediaDelivery SessionId</i>	string	A unique identifier for a media delivery session. This should not contain any user-identifiable data.	Clause A.2.

7.3.3 Structured data types

7.3.3.1 IpPacketFilterSet type

Table 7.3.3.1-1: Definition of type IpPacketFilterSet

Property name	Data type	Cardinality	Description
<i>direction</i>	string	1..1	Packet Filter Set direction.
<i>sourceAddress</i>	IpAddr	0..1	Source IP address or IPv6 prefix.
<i>destinationAddress</i>	IpAddr	0..1	Destination IP address or IPv6 prefix.
<i>protocolNumber</i>	Uint8	0..1	Transport layer protocol number as it appears in the Protocol field of the IPv4 packet header or the Next Header field of the IPv6 packet header.
<i>sourcePort</i>	Uint16	0..1	Source port number.
<i>destinationPort</i>	Uint16	0..1	Destination port number.
<i>differentiatedServicesCodePoint</i>	Uint6	0..1	Differentiated Services Code Point (see annex C).
<i>flowLabel</i>	Uint20	0..1	IPv6 Flow Label.
<i>securityParametersIndex</i>	Uint32	0..1	IPv6 Security Parameters Index (SPI).

7.3.3.2 ApplicationFlowDescription type

This data type is used to declare the properties of an application data flow to the Media AF during the course of a media delivery session. Its properties are used to describe a Service Data Flow to the 5G Core for the purpose of application traffic detection.

Table 7.3.3.2-1: Definition of type ApplicationFlowDescription

Property name	Data type	Cardinality	Description
<i>filterMethod</i>	SdfMethod	1..1	The filtering method used to identify packets belonging to this application flow (see clause 7.3.4.2).
<i>packetFilter</i>	IpPacketFilterSet	0..1	Description of the application flow in terms of packet header field values (see below).
<i>domainName</i>	string	0..1	Description of the application flow in terms of the Fully-Qualified Domain Name (FQDN) of the Media AS targeted at reference point M4 (see below).
<i>mediaType</i>	MediaType	0..1	The type of media carried by this application flow (see NOTE 1).
<i>mediaTransportParameters</i>	ProtocolDescription	0..1	The set of media transport protocol parameters to be used by the 5G Core for the purpose of PDU Set identification and/or end of data burst detection on this application flow (see NOTE 2).
<i>uplinkMultiplexedMediaInfos</i>	array(MpxMediaInfo)	0..1	One or more sets of media identification information parameters to be used by the 5G Core for the purpose of uplink multiplexed media identification on this application flow (see NOTE 3).
<i>downlinkMultiplexedMediaInfos</i>	array(MpxMediaInfo)	0..1	One or more sets of media identification information parameters to be used by the 5G Core for the purpose of downlink multiplexed media identification on this application flow (see NOTE 3).

NOTE 1: Enumeration *MediaType* is specified in clause 5.6.3.3 of TS 29.514 [18].

NOTE 2: Data type *ProtocolDescription* is specified in clause 5.5.4.13 of TS 29.571 [33].

NOTE 3: Data type *MpxMediaInfo* is specified in clause 5.6.2.61 of TS 29.514 [18].

Exactly one of the following properties shall be populated: *packetFilter*, *domainName*.

7.3.3.3 UnidirectionalQosSpecification type

Table 7.3.3.3-1: Definition of type UnidirectionalQosSpecification

Property name	Data type	Cardinality	Usage	Description
<i>maximumBitRate</i>	BitRate	1..1	RO	Maximum bit rate supported by the 5G System. Populated by the Media AF.
<i>maximumAuthorisedBitRate</i>	BitRate	0..1	RW	Maximum bit rate authorised by the Media Application Provider.
<i>minimumPacketLossRate</i>	PacketLoss Rate	0..1	RW	Minimum packet loss rate permitted by the Media Application Provider, expressed in tenths of a percent.
<i>pduSetQosLimits</i>	PDUSetQosPara	0..1	RW	QoS limits for PDU Sets, including minimum delay budget and minimum error rate permitted by the Media Application Provider, and an indication by the Media Application Provider of whether the receiving application is sensitive to the loss of individual PDUs in a PDU Set (see NOTE).
NOTE: Data type <i>PDUSetQosPara</i> is specified in clause 5.5.4.11 of TS 29.571 [33].				

7.3.3.4 PolicyConstraints type

This data type is used to specify permitted ranges of QoS parameters and/or to mandate the use of certain QoS features of the 5G System.

Table 7.3.3.4-1: Definition of type PolicyConstraints

Property name	Data type	Cardinality	Description
<i>componentReference</i>	string	1..1	A unique string identifying this QoS specification within the scope of its parent.
<i>qosReference</i>	string	0..1	As specified in clause 5.6.2.7 of TS 29.514 [18].
<i>downlinkQosSpecification</i>	UnidirectionalQos Specification	0..1	QoS specification in the downlink direction (see below and clause 7.3.3.3).
<i>uplinkQosSpecification</i>	UnidirectionalQos Specification	0..1	QoS specification in the uplink direction (see below and clause 7.3.3.3).
<i>pduSetMarking</i>	boolean	0..1	Indicates that packets at reference point M4 are required to include PDU Set marking if the media transport protocol supports this. Default value <i>false</i> if omitted.
<i>downlinkDataBurstSizeMarkingRequired</i>	boolean	0..1	Indicates that downlink packets at reference point M4 are required to include data burst size marking if the media transport protocol supports this. Default value <i>false</i> if omitted.
<i>downlinkTimeToNextBurstMarkingRequired</i>	boolean	0..1	Indicates that downlink packets at reference point M4 are required to include time to next burst marking if the media transport protocol supports this. Default value <i>false</i> if omitted.
<i>downlinkExpeditedTransferIndicationMarkingRequired</i>	boolean	0..1	Indicates that downlink packets at reference point M4 are required to include expedited transfer indication marking if the media transport protocol supports this. Default value <i>false</i> if omitted.

At least one of the following properties shall be populated: *qosReference*, *downlinkQosSpecification*, *uplinkQosSpecification*.

7.3.3.5 UnidirectionalBitRateSpecification type

Table 7.3.3.5-1: Definition of type UnidirectionalBitRateSpecification

Property name	Data type	Cardinality	Description
<i>maximumRequestedBitRate</i>	BitRate	1..1	Maximum requested bit rate.
<i>minimumDesiredBitRate</i>	BitRate	0..1	Minimum desired bit rate.
<i>minimumRequestedBitRate</i>	BitRate	1..1	Minimum requested bit rate.

7.3.3.6 ClientPolicySpecification type

Table 7.3.3.6-1: Definition of type ClientPolicySpecification

Property name	Data type	Cardinality	Description
<i>downlinkBitRates</i>	UnidirectionalBitRateSpecification	1..1	Bit rate specification for the downlink direction (see clause 7.3.3.5).
<i>uplinkBitRates</i>	UnidirectionalBitRateSpecification	1..1	Bit rate specification for the uplink direction (see clause 7.3.3.5).
<i>desiredPacketLatency</i>	number	0..1	Desired packet latency in milliseconds, expressed as a positive floating-point value (see NOTE 1).
<i>desiredPacketLossRate</i>	PacketLossRate	0..1	Desired packet loss rate expressed in tenths of a percent (see NOTE 1).
<i>desiredDownlinkPduSetQosParameters</i>	PDUSetQosPara	0..1	Desired PDU Set QoS parameters for the downlink direction (see NOTE 2).
<i>desiredUplinkPduSetQosParameters</i>	PDUSetQosPara	0..1	Desired PDU Set QoS parameters for the uplink direction (see NOTE 2).
<i>downlinkExpeditedTransferIndication</i>	boolean	0..1	If set to <i>true</i> indicates this object applies to an application data flow whose transport is to be expedited by the network. In this case, <i>downlinkBitRates</i> and <i>uplinkBitRates</i> shall be set to the same values. If set to <i>false</i> indicates this object applies to an application data flow whose transport is not to be expedited by the network. Default value is <i>false</i> if omitted.
<i>l4sRequired</i>	boolean	0..1	Requirement to enable ECN marking for L4S functionality for the media delivery session.
<i>qoSMonitoringRequired</i>	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].

7.3.3.7 ChargingSpecification type

Table 7.3.3.7-1: Definition of type ChargingSpecification

Property name	Data type	Cardinality	Description
<i>sponsorId</i>	SponId	0..1	As defined in clause 5.6.2.3 of TS 29.514 [18].
<i>sponsoringStatus</i>	SponsoringStatus	0..1	
<i>permittedUes</i>	array(Gpsi)	0..1	Set of UEs permitted to instantiate the parent Policy Template. If present, the array shall contain at least one member. If absent, all UEs are permitted.

7.3.3.8 TypedLocation type

Table 7.3.3.8-1: Definition of TypedLocation type

Property name	Data type	Cardinality	Description
<i>locationIdentifierType</i>	CellIdentifierType	1..1	The type of cell location present in the <i>location</i> property.
<i>location</i>	string	1..1	Identifies the cell location.

7.3.3.9 OperationSuccessResponse type

Table 7.3.3.9-1: Definition of OperationSuccessResponse type

Property name	Type	Cardinality	Description
<i>success</i>	boolean	1..1	Indicates whether an operation was successful (<i>true</i>) or not (<i>false</i>).
<i>reason</i>	string	0..1	Optional explanation of the success or otherwise of the operation.

7.3.3.10 EdgeProcessingEligibilityCriteria type

Table 7.3.3.10-1: Definition of EdgeProcessingEligibilityCriteria type

Property name	Type	Cardinality	Description
<i>applicationFlowDescriptions</i>	array(ApplicationFlowDescription)	1..1	A set of application flow descriptions that are to be used as triggers for invoking edge media processing (see NOTE 1). If the set is empty, edge media processing may be invoked for an otherwise eligible media stream session on any service data flow. Valid <i>ApplicationFlowDescription</i> elements: - <i>domainName</i> - <i>packetFilter.destinationAddress</i> and <i>packetFilter.destinationPort</i> - <i>packetFilter.differentiatedServices</i> - <i>packetFilter.flowLabel</i> Other <i>ApplicationFlowDescription</i> settings shall be rejected by the Media AF.
<i>ueLocations</i>	array(LocationArea5G)	1..1	A set of geographical areas in which edge media processing is to be triggered when a UE is present (see NOTE 2). If the set is empty, edge media processing may be invoked for an otherwise eligible media stream session in any location.
<i>timeWindows</i>	array(TimeWindow)	1..1	Edge media processing is triggered when the media streaming session is taking place during one of the indicated time windows (see NOTE 2). If the set is empty, edge media processing may be invoked for an otherwise eligible media stream session at any time.
<i>appRequest</i>	boolean	1..1	When set <i>true</i> , edge media processing is to be triggered based on application request only.

NOTE 1: The usage of these fields to influence route selection and EAS reselection are for future study.

NOTE 2: Data types *LocationArea5G* and *TimeWindow* are defined in TS 24.558 [14].

7.3.3.11 EndpointAddress type

Table 7.3.3.11-1: Definition of EndpointAddress type

Property name	Type	Cardinality	Description
<i>domainName</i>	string	1..1	Internet domain name of the endpoint.
<i>portNumbers</i>	array(Uint16)	1..1	Port number of each endpoint. The array shall contain at least one member.

7.3.3.12 RelativeMediaEntryPoint type

Table 7.3.3.12-1: Definition of type RelativeMediaEntryPoint

Property name	Data type	Cardinality	Description
<i>relativePath</i>	RelativePath	1..1	A relative path (i.e., without a scheme or any leading forward slash characters) to the Media Entry Point document resource. The semantics are dependent on the value of the <i>contentType</i> or <i>protocol</i> property.
<i>contentType</i>	string	1..1	The MIME content type of this Media Entry Point. This property shall be mutually exclusive with <i>protocol</i> .
<i>protocol</i>	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 <i>contentType</i> .
<i>profiles</i>	array(Uri)	0..1	An optional list of conformance profile identifiers associated with this Media Entry Point, each one expressed as a URI. A profile URI may indicate an interoperability point, for example. If present, the array shall contain at least one item.

7.3.3.13 CachingConfiguration type

Table 7.3.3.13-1: Definition of type CachingConfiguration

Property name	Data type	Cardinality	Description
<i>urlPatternFilter</i>	string	1..1	A pattern used to match media resource URLs to determine whether a given media resource falls within the scope of this caching configuration. The format of the pattern shall be a regular expression as specified in [36].
<i>cachingDirectives</i>	object	1..1	If a <i>urlPatternFilter</i> applies to a resource, then the provided <i>cachingDirectives</i> shall be applied by the Media AS.
<i>statusCodeFilters</i>	array(integer)	0..1	The set of HTTP response status codes to which these caching directives apply. If the property is present, the array shall contain at least one item. If absent, the caching directives shall apply to all HTTP response status codes.
<i>noCache</i>	boolean	0..1	If set to <i>true</i> , media resources falling within the scope of these caching directives shall be marked as not to be cached when served by the Media AS. Default value if omitted: <i>false</i> .
<i>maxAge</i>	Unit32	0..1	The caching time-to-live period, expressed in seconds, of media resources falling within the scope of these caching directives. This determines the minimum period for which the Media AS shall cache matching media resources. If <i>noCache</i> is <i>false</i> , it also determines the time-to-live period signalled by the Media AS when it serves such media resources.

7.3.3.14 BdtWindow type

Table 7.3.3.14-1: Definition of BdtWindow type

Property name	Data type	Cardinality	Description
<i>timeWindow</i>	TimeWindow	1..1	The absolute start date-time and stop date-time of the Background Data Transfer window populated by the Media AF (see NOTE).
<i>maximumDownlink BitRate</i>	BitRate	0..1	The maximum bit rate that the Media Client requests or is authorised to use in the downlink direction during <i>timeWindow</i> .
<i>maximumUplink BitRate</i>	BitRate	0..1	The maximum bit rate that the Media Client requests or is authorised to use in the uplink direction during <i>timeWindow</i> .
NOTE: Data type <i>TimeWindow</i> is defined in TS 29.122 [20].			

7.3.4 Enumerated data types

7.3.4.1 CellIdentifierType enumeration

The *CellIdentifierType* enumeration indicates the type of cell identifier as defined in TS 23.003 [16].

Table 7.3.4.1-1: Definition of CellIdentifierType enumeration

Enumeration value	Description
<i>CGI</i>	Cell Global Identification.
<i>ECGI</i>	E-UTRAN Cell Global Identification.
<i>NCGI</i>	NR Cell Global Identity.

7.3.4.2 SdfMethod enumeration

Table 7.3.4.2-1: Definition of SdfMethod enumeration

Enumeration value	Description
<i>5_TUPLE</i>	Service Data Flow described by source (Media Access Function) IP address and port number, destination (Media AS) IP address and port number and protocol number. Wildcard values are not permitted in the Service Data Flow description.
<i>2_TUPLE</i>	Service Data Flow described by source (Media Access Function) IP address and destination (Media AS) IP address duple.
<i>TYPE_OF_SERVICE_MARKING</i>	Service Data Flow described by Type of Service (TOS) marking.
<i>FLOW_LABEL</i>	Service Data Flow described by Ipv6 flow label marking.
<i>DOMAIN_NAME</i>	Service Data Flow described by a domain name.

7.3.4.3 ProvisioningSessionType enumeration

Table 7.3.4.3-1: Definition of ProvisioningSessionType enumeration

Enumeration value	Description
<i>MS_DOWNLINK</i>	Downlink media streaming
<i>MS_UPLINK</i>	Uplink media streaming
<i>RTC</i>	Real-time media communication (RTC)

7.3.4.4 EASRelocationTolerance enumeration

Table 7.3.4.4-1: Definition of EASRelocationTolerance enumeration

Enumeration value	Description
<i>RELOCATION_UNAWARE</i>	The application is not aware of any EAS relocation that may happen. Relocation procedures may be executed without any restrictions.
<i>RELOCATION_TOLERANT</i>	The application may tolerate EAS relocation, but requirements for the relocation procedure must be met. An application context may need to be transferred.
<i>RELOCATION_INTOLERANT</i>	The application does not tolerate relocation.

7.3.4.5 ContentTransferMode enumeration

Table 7.3.4.5-1: Definition of ContentTransferMode enumeration

Enumeration value	Description
<i>PULL</i>	Content is pulled by or from the Media AS.
<i>PUSH</i>	Content is pushed into or by the Media AS.

7.4 Security

7.4.1 General

The Media AF shall enable secure provision of information in the Media Delivery System by authenticated and authorised Media-aware Applications or Media Application Providers.

7.4.2 Authorising access to provisioning APIs on the Media AF

Access to the *Maf_Provisioning* API of the Media AF should be authorised by means of the OAuth 2.0 protocol specified in RFC 6749 [47] using one of the security flow grant types specified in table 7.4.2-1 below. Based on the content of the supplied access token, the Media AF shall determine whether the API invoker is authorised to invoke the requested service operation in terms of at least the targeted resource and HTTP method, and hence the underlying Media Delivery feature.

Table 7.4.2-1: OAuth 2.0 flow grant types supported by Media AF for invoking *Maf_Provisioning* API

API invoker	Reference point	Supported OAuth 2.0 security flow grant types
Media Application Provider	M1	Client credentials

NOTE: The provisioning and negotiation of the security method is not specified in this release.

When CAPIF (see TS 29.222 [48]) is used for external API exposure:

- The CAPIF core function shall play the role of authorization server, the Media AF shall play the role of resource server, and the Media Application Provider shall play the role of API invoker.
- Before invoking any *Maf_Provisioning* service operation on the Media AF, the Media Application Provider shall negotiate the security method (PKI, TLS-PSK or OAuth 2.0) with the CAPIF core function and shall ensure that the Media AF has the required credentials to authenticate access tokens subsequently presented by the API invoker (see clauses 5.6.2.2 and 6.2.2.2 of TS 29.222 [48]).
- If PKI or TLS-PSK is the selected security method between the Media Application Provider and the Media AF, the Media AF shall, upon invocation of a *Maf_Provisioning* service operation, retrieve the authorisation information from the CAPIF core function as described in clause 5.6.2.4 of TS 29.222 [48].

- If OAuth 2.0 [47] is the selected security method between the API invoker and the Media AF, the API invoker shall, prior to invoking *Maf_Provisioning* service operations on the Media AF, obtain an access token from the authorization server (CAPIF core function) by invoking the *Obtain_Authorization* service operation specified in clause 5.6.2.3.2 of TS 29.222 [48].

Otherwise, when the OAuth 2.0 [47] framework is used for authorisation of *Maf_Provisioning* service operation invocations by the Media Application Provider at reference point M1 independently of CAPIF:

- The Media AF shall play the role of both authorization server and resource server.
- The Media Application Provider shall play the role of client.
- The Media Application Provider shall obtain an access token from the authorization server (Media AF) using the client credentials authorization grant specified in section 4.4 of RFC 6749 [47] prior to invoking *Maf_Provisioning* service operations on the resource server (Media AF) at reference point M1.

7.4.3 Authorising access to media session handling APIs on the Media AF

Access to the *Maf_SessionHandling* API of the Media AF shall be authorised by means of the OAuth 2.0 protocol specified in RFC 6749 [47] using one of the security flow grant types specified in table 7.4.3-1 below. Based on the content of the supplied access token, the Media AF shall determine whether the API invoker is authorised to invoke the requested service operation in terms of at least the targeted resource and HTTP method, and hence the underlying Media Delivery feature.

Table 7.4.3-1: OAuth 2.0 flow grant types supported by Media AF for invoking *Maf_SessionHandling* API

API invoker	Reference point	Supported OAuth 2.0 security flow grant types
Media AS	M3	Client credentials
Media Session Handler	M5	Client credentials, Authorization code

NOTE: The provisioning and negotiation of the security method is not specified in this release.

When CAPIF (see TS 29.222 [48]) is used for external API exposure:

- The CAPIF core function shall play the role of authorization server, the Media AF shall play the role of resource server, and the Media AS or Media Session Handler (as appropriate) shall play the role of API invoker.
- Before invoking any *Maf_SessionHandling* service operation on the Media AF, the API invoker shall negotiate the security method (PKI, TLS-PSK or OAuth 2.0) with the CAPIF core function and shall ensure that the Media AF has the required credentials to authenticate access tokens subsequently presented by the intended API invoker (see clauses 5.6.2.2 and 6.2.2.2 of TS 29.222 [48]).
- If PKI or TLS-PSK is the selected security method between the API invoker and the Media AF, the Media AF shall, upon invocation of a *Maf_SessionHandling* service operation, retrieve the authorisation information from the CAPIF core function as described in clause 5.6.2.4 of TS 29.222 [48].
- If OAuth 2.0 [47] is the selected security method between the API invoker and the Media AF, the API invoker shall, prior to invoking *Maf_SessionHandling* service operations on the Media AF, obtain an access token from the authorization server (CAPIF core function) by invoking the *Obtain_Authorization* service operation specified in clause 5.6.2.3.2 of TS 29.222 [48].

Otherwise, when the OAuth 2.0 [47] framework is used to authorise API invocations of *Maf_SessionHandling* service operation invocations by the Media AS at reference point M3 independently of CAPIF:

- The Media AF shall play the role of both authorization server and resource server.
- The Media AS shall play the role of client.
- The Media AS shall obtain an access token from the authorization server using the client credentials grant specified in section 4.4 of RFC 6749 [47] prior to invoking *Maf_Provisioning* service operations on the resource server (Media AF) at reference point M3.

Otherwise, when the OAuth 2.0 [47] framework is used to authorise API invocations of *Maf_SessionHandling* service operation invocations by the Media Session Handler at reference point M5 independently of CAPIF:

- Either the Media AF shall play the role of both authorization server and resource server, or the Media AF shall play the role of the resource server, and the Media Application Provider plays the role of the authorization server.
- The Media Session Handler shall play the role of client.
- The Media Session Handler shall obtain an access token from the authorization server using either the client credentials grant specified in section 4.4 of RFC 6749 [47], or the authorization code grant specified in section 4.1 of [47] prior to invoking *Maf_Provisioning* service operations on the resource server (Media AF) at reference point M5.

8 Maf_Provisioning service

8.1 Overview

This clause defines the provisioning API used by a Media Application Provider at reference point M1 to configure downlink or uplink Media Delivery services. The corresponding OpenAPI definitions for the *Maf_Provisioning* service are specified in clause A.3. A summary of the resource structure is shown in table 8.1-1 below. The default endpoint address of the Media AF at reference point M1 is specified in clause 7.1.2.1.

Table 8.1-1: Resource structure of Maf_Provisioning APIs

HTTP request path element hierarchy	Description	Allowed HTTP methods					Resource structure definition clause	OpenAPI definition clause
		Create	Retrieve	Update	Destroy	Non-RESTful operation		
provisioning-sessions	Provisioning Sessions collection	POST	GET				8.2.2	A.3.1
<i>{provisioningSessionId}</i>	Provisioning Session resource		GET		DELETE			
content-protocols	Content Protocols resource		GET				8.3.2	A.3.2
certificates	Server Certificates collection	POST					8.4.2	A.3.3
<i>{certificateId}</i>	Server Certificate resource		GET	PUT	DELETE			
content-preparation-templates	Content Preparation Templates collection	POST					8.5.2	A.3.4
<i>{contentPreparationTemplateId}</i>	Content Preparation Template resource		GET	PUT, PATCH	DELETE			
edge-resources-configurations	Edge Resources Configurations collection	POST					8.6.2	A.3.5
<i>{edgeResourcesConfigurationId}</i>	Edge Resources Configuration resource		GET	PUT, PATCH	DELETE			
policy-templates	Policy Templates collection	POST					8.7.2	A.3.6
<i>{policyTemplateId}</i>	Policy Template resource		GET	PUT, PATCH	DELETE			
content-hosting-configuration	Content Hosting Configuration resource	POST	GET	PUT, PATCH	DELETE		8.8.2	A.3.7
purge	Content Hosting cache purge operation					POST		

content-publishing-configuration	Content Publishing Configuration resource	POST	GET	PUT, PATCH	DELETE		8.9.2	A.3.8
purge	Content Publishing cache purge operation					POST		
rtc-configuration	RTC Configuration resource	POST	GET	PUT, PATCH	DELETE		8.10.2	A.3.9
metrics-reporting-configuration	Metrics Reporting Configuration collection	POST					8.11.2	A.3.10
<i>{metricsReportingConfigurationId}</i>	Metrics Reporting Configuration resource		GET	PUT, PATCH	DELETE			
consumption-reporting-configuration	Consumption Reporting Configuration resource	POST	GET	PUT, PATCH	DELETE		8.12.2	A.3.11
event-data-processing-configurations	Event Data Processing Configuration collection	POST					8.13.2	A.3.12
<i>{eventDataProcessingConfigurationId}</i>	Event Data Processing Configuration resource		GET	PUT, PATCH	DELETE			

8.2 Provisioning Sessions API

8.2.1 Overview

The Provisioning Sessions API is used by the Media Application Provider to instantiate and manipulate Provisioning Sessions in the Media Delivery System, as described in clause 5.2.2. Having created a Provisioning Session, the Media Application Provider then goes on to discover the content protocols it supports using the API specified in clause 8.3, and to provision other Media Delivery features in the context of that Provisioning Session, using the APIs specified in clause 8.4 *et seq.* Certain of these features are only applicable to the type of Provisioning Session created.

8.2.2 Resource structure

The Provisioning Sessions API is accessible through the following URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/

Table 8.2.2-1 specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the sub-resource path specified in the second column of the table shall be appended to the above URL base path.

Table 8.2.2-1: Operations supported by the Provisioning Sessions API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Enumerate Provisioning Sessions		GET	Enumerate the resource identifiers of the Provisioning Session collection.
Create Provisioning Session		POST	Create a new Provisioning Session resource.
Retrieve Provisioning Session	{provisioningSessionId}	GET	Retrieve an existing Provisioning Session resource for inspection.
Destroy Provisioning Session		DELETE	Destroy an existing Provisioning Session resource.

8.2.3 Data model

8.2.3.1 ProvisioningSession resource

Different properties are present in the *ProvisioningSession* resource depending on the type of Provisioning Session indicated in the *provisioningSessionType* property, and this is specified in the *Applicability* column.

Table 8.2.3.1-1: Definition of ProvisioningSession resource

Property name	Type	Cardinality	Usage	Description	Applicability
<i>provisioningSessionId</i>	ResourceId	1..1	C: RO R: RO U: –	A unique identifier assigned to this Provisioning Session by the Media AF on creation.	All types.
<i>provisioningSessionType</i>	ProvisioningSessionType	1..1	C: RW R: RW U: –	The type of Provisioning Session.	All types.
<i>externalServiceId</i>	string	1..1	C: RW R: RO U: –	An identifier, nominated by the Media Application Provider, that identifies this Provisioning Session to the Media Client. Every Provisioning Session in a Media Delivery System shall have a different service identifier. Takes the form of a reverse FQDN e.g., com.provider.service to ensure global applicability across different Media Delivery Systems. Used by the Media Session Handler to invoke the network media session handling operations specified in clause 5.3 and clause 9, in particular to fetch full Service Access Information from the Media AF (see clauses 5.3.2 and 9.2).	All types.
<i>aspld</i>	AspId	0..1	C: RW R: RW U: –	The identity of the Application Service Provider responsible for this Provisioning Session, as specified in clause 5.6.2.3 of TS 29.514 [18].	All types.
<i>appld</i>	ApplicationId	1..1	C: RW R: RW U: –	The Application Identifier (see table 5.4.2-1 of 1 29.571 [33]) to which this Provisioning Session pertains. The same <aspld, appld> duple may be present in several Provisioning Sessions in a given Media Delivery System. Used as the AF Application identifier (see clause 5.6.2.3 of TS 29.514 [18]) for PCF interactions. When a Media AF in the Trusted DN is provisioned from outside the Trusted DN, the NEF is responsible for mapping an external Application Identifier to the corresponding internal AF Application Identifier known to the PCF.	All types.
<i>locationReporting</i>	boolean	0..1		If <i>true</i> , the Media Session Handler is required to populate UE location information 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) with a Media AF deployed by an MNO or trusted third party. If <i>false</i> or omitted, UE location shall not be populated by the Media Session Handler in any of the abovementioned interactions.	All types.
<i>serverCertificateIds</i>	array(ResourceId)	0..1	C: RO R: RO U: –	A list of Server Certificate identifiers currently associated with this Provisioning Session.	MS_DOWNLINK, MS_UPLINK, RTC
<i>contentPreparationTemplateIds</i>	array(ResourceId)	0..1	C: RO R: RO U: –	A list of Content Preparation Template identifiers currently associated with this Provisioning Session.	MS_DOWNLINK, MS_UPLINK
<i>metricsReportingConfigurationIds</i>	array(ResourceId)	0..1	C: RO R: RO U: –	A list of Metrics Reporting Configuration identifiers currently associated with this Provisioning Session.	MS_DOWNLINK, MS_UPLINK, RTC
<i>policyTemplateIds</i>	array(ResourceId)	0..1	C: RO R: RO U: –	A list of Policy Template identifiers currently associated with this Provisioning Session.	MS_DOWNLINK, MS_UPLINK, RTC

<i>edgeResources ConfigurationIds</i>	array(ResourceId)	0..1	C: RO R: RO U: –	A list of Edge Resources Configuration identifiers currently associated with this Provisioning Session.	<i>MS_DOWNLINK, MS_UPLINK, RTC</i>
<i>eventDataProcessing ConfigurationIds</i>	array(ResourceId)	0..1	C: RO R: RO U: –	A list of Event Data Processing Configuration identifiers currently associated with this Provisioning Session.	<i>MS_DOWNLINK, MS_UPLINK</i>

8.3 Content Protocols Discovery API

8.3.1 Overview

The Content Protocols Discovery API is used by a Media Application Provider to find out which content ingest or egest protocols are supported by the Media AS instance(s) associated with a Provisioning Session in the Media AF.

8.3.2 Resource structure

The Content Protocols Discovery API is accessible through the following URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 8.3.2-1 below specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the Provisioning Session identifier shall be substituted into *{provisioningSessionId}* in the above URL template and the sub-resource path specified in the second column of the table shall be appended to the URL base path.

Table 8.3.2-1: Operations supported by the Ingest Protocols Discovery API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Fetch list of supported content protocols	content-protocols	GET	Retrieve a list of supported content protocols.

8.3.3 Data model

8.3.3.1 ContentProtocols resource

Table 8.3.3.1-1: Definition of ContentProtocols resource

Property name	Data Type	Cardinality	Description
<i>downlinkIngestProtocols</i>	array(ContentProtocolDescriptor)	0..1	A set of <i>ContentProtocolDescriptor</i> objects, as specified in clause 8.3.3.2, each one uniquely identifying a content ingest protocol supported at reference point M2 and M10 by the Media AS associated with the parent Provisioning Session. If present, the array shall contain at least one member.
<i>uplinkEgestProtocols</i>	array(ContentProtocolDescriptor)	0..1	A set of <i>ContentProtocolDescriptor</i> objects, as specified in clause 8.3.3.2, each one uniquely identifying a content egest protocol supported at reference point M2 and M10 by the Media AS associated with the parent Provisioning Session. If present, the array shall contain at least one member.
<i>downlinkDistributionProtocols</i>	array(ContentProtocolDescriptor)	0..1	A set of <i>ContentProtocolDescriptor</i> objects, as specified in clause 8.3.3.2, each one uniquely identifying a distribution protocol supported at reference point M4 and M10 by the Media AS associated with the parent Provisioning Session. If present, the array shall contain at least one member.
<i>uplinkContributionProtocols</i>	array(ContentProtocolDescriptor)	0..1	A set of <i>ContentProtocolDescriptor</i> objects, as specified in clause 8.3.3.2, each one uniquely identifying a contribution protocol supported at reference point M4 and M10 by the Media AS associated with the parent Provisioning Session. If present, the array shall contain at least one member.
<i>geoFencingLocatorTypes</i>	array(Uri)	0..1	A set of fully-qualified term identifiers, each one indicating a content geo-fencing locator type supported at reference point M2 by the Media AS associated with the parent Provisioning Session. (See clause B.1.) If present, the array shall contain at least one member.

8.3.3.2 ContentProtocolDescriptor type

Table 8.2.3.2-1: Definition of ContentProtocolDescriptor type

Property name	Data Type	Cardinality	Description
<i>termIdentifier</i>	Uri	1..1	A fully-qualified term identifier indicating support for a content protocol (see NOTE).
<i>descriptionLocator</i>	AbsoluteUrl	0..1	The location of a description of the content protocol, for example the public web URL of its specification.
NOTE: The controlled vocabulary of terms identifying 5G Media Streaming content ingest and content egest protocols at reference point M2 and M10 is specified in clause 8 of TS 26.512 [6]. The controlled vocabulary of terms identifying 5G Media Streaming content distribution and content contribution protocols at reference point M4 is specified in clause 10 of TS 26.512 [6].			

8.4 Server Certificates provisioning API

8.4.1 Overview

The Server Certificates Provisioning API is used to provision X.509 [10] server certificates that can be referenced by a Content Hosting Configuration and subsequently presented by the Media AS when it distributes content to Media Clients at reference point M4 using Transport Layer Security [13]. Server Certificate resources are provisioned within the scope of an enclosing Provisioning Session.

8.4.2 Resource structure

The Server Certificates Provisioning API is accessible through the following URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 8.4.2-1 specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the Provisioning Session identifier shall be substituted into *{provisioningSessionId}* in the above URL template and the sub-resource path specified in the second column shall be appended to the URL base path.

Table 8.4.2-1: Operations supported by the Server Certificates Provisioning API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Create Server Certificate	certificates	POST	Invoked on the Server Certificates collection associated with a Provisioning Session to request that the Media AF creates a new Server Certificate on behalf of the Media Application Provider.
Reserve Server Certificate	certificates?csr	POST	Invoked on the Server Certificates collection associated with a Provisioning Session to solicit a Certificate Signing Request for a new Server Certificate.
Retrieve Server Certificate	certificates/{certificateId}	GET	Used to retrieve a previously created or uploaded Server Certificate.
Upload Server Certificate		PUT	Used by the Media Application Provider to supply a new Server Certificate in response to a Certificate Signing Request previously solicited from the Media AF.
Destroy Server Certificate		DELETE	Removes the specified Server Certificate from the set of certificates associated with the Provisioning Session.
NOTE: The Server Certificate resource identifier {certificateId} may differ from the serial number of the X.509 certificate.			

8.4.3 Data model

8.4.3.1 Certificate Signing Request

The Certificate Signing Request shall comply with the Privacy-Enhanced Mail (PEM) textual format specified in RFC 7468 [12], i.e. a Base64-encoded DER certificate request or certificate, including leading and trailing encapsulation boundary lines.

The MIME content type shall be *application/x-pem-file*.

8.4.3.2 Server Certificate resource

The Server Certificate resource shall comply with the Privacy-Enhanced Mail (PEM) textual format specified in RFC 7468 [12], i.e. a Base64-encoded DER certificate, including leading and trailing encapsulation boundary lines. The resource shall include only the public parts of the X.509 certificate [10]. In particular, the private key shall not be included.

The MIME content type shall be *application/x-pem-file*.

8.5 Content Preparation Templates provisioning API

8.5.1 Overview

Content Preparation Templates are used to specify manipulations applied by a Media AS to downlink media resources ingested at reference point M2 or M10 for distribution via reference point M4 service locations, or to uplink media resources contributed at reference point M4 for egest at reference point M2 or M10. The Content Preparation Templates Provisioning API is used to provision a Content Preparation Template within the scope of a Provisioning Session that can subsequently be referenced from a Content Hosting Configuration or Content Publishing Configuration.

8.5.2 Resource structure

The Content Preparation Templates Provisioning API is accessible through the following URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 8.5.2-1 specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the Provisioning Session identifier shall be substituted into *{provisioningSessionId}* in the above URL template and the sub-resource path specified in the second column shall be appended to the URL base path.

Table 8.5.2-1: Operations supported by the Content Preparation Templates Provisioning API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Create Content Preparation Template	content-preparation-templates	POST	Invoked on a Content Preparation Templates collection when supplying a new Content Preparation Template resource.
Retrieve Content Preparation Template	content-preparation-templates/ <i>{contentPreparationTemplateId}</i>	GET	Retrieve a specific Content Preparation Template resource.
Update Content Preparation Template		PUT, PATCH	Modify an existing Content Preparation Template resource.
Destroy Content Preparation Template		DELETE	Destroy an existing Content Preparation Template resource.

8.5.3 Data model

The data model of the Content Preparation Template resource shall be determined by its MIME content type.

8.6 Edge Resources provisioning API

8.6.1 General

The Edge Resources Provisioning API is used by the Media Application Provider to provision edge resource usage for media streaming sessions associated with the parent Provisioning Session. The information serves as a template to select or instantiate the appropriate Media AS EAS instance that will serve the media session to the UE.

8.6.2 Resource structure

The Edge Resources API is accessible through the following URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 8.6.2-1 specifies the operations and the corresponding HTTP methods that are supported by the Edge Resources API. In each case, the Provisioning Session identifier shall be substituted into *{provisioningSessionId}* in the above URL template and the sub-resource path indicated by the second column of the table shall be appended to the resulting URL base path.

Table 8.6.2-1: Operations supported by the Edge Resources API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Configure Edge Resources	edge-resources-configurations	POST	Invoked on the Edge Resources Configurations collection to create a new Edge Resources Configuration resource.
Retrieve Edge Resources Configuration	edge-resources-configurations/ <i>{edgeResourcesConfigurationId}</i>	GET	Retrieve a specific Edge Resources Configuration resource.
Modify Edge Resources Configuration		PUT, PATCH	Modify or replace an existing Edge Resources Configuration resource.
Destroy Edge Resources Configuration		DELETE	Destroy an existing Edge Resources Configuration resource.

8.6.3 Data model

8.6.3.1 EdgeResourcesConfiguration resource type

Table 8.6.3.1-1: Definition of EdgeResourcesConfiguration resource type

Property name	Type	Cardinality	Description
<i>edgeResourcesConfigurationId</i>	ResourceId	1..1	A resource identifier for this Edge Resources Configuration assigned by the Media AF when the resource is created that is unique within the scope of the enclosing Provisioning Session.
<i>edgeManagementMode</i>	EdgeManagementMode	1..1	Indicates whether the management of edge resources is client-driven or AF-driven. (See clause 8.6.3.2.)
<i>eligibilityCriteria</i>	EdgeProcessing EligibilityCriteria	0..1	Condition to activate edge resources for this Provisioning Session. If omitted, it shall be assumed that all media delivery sessions related to the parent Provisioning Session use edge resources. (See clause 7.3.3.10.)
<i>easRequirements</i>	EASRequirements	1..1	Requirements on the EAS Profile used by the Media AF or by the EEC to discover and select one or more Media EAS instances to serve media streaming sessions. (See clause 8.6.3.3.)
<i>easRelocationRequirements</i>	M1EASRelocation Requirements	0..1	EAS relocation tolerance and requirements. If not present, the Media AF shall assume that the application is unaware of context transfer and that transfers to a target Media EAS are allowed. (See clause 8.6.3.4.)

8.6.3.2 EdgeManagementMode enumeration

Table 8.6.3.2-1: Definition of EdgeManagementMode enumeration

Enumeration value	Description
<i>EM_AF_DRIVEN</i>	The Media AF, in coordination with the Media Session Handler, assigns edge resources and directs application traffic to the Media EAS instance transparently to the application running on the UE.
<i>EM_CLIENT_DRIVEN</i>	An Application Client running on the UE explicitly manages edge resources via the EES at reference point EDGE-1.

8.6.3.3 EASRequirements type

Table 8.6.3.3-1: Definition of EASRequirements type

Property name	Type	Cardinality	Description
<i>easProviderIds</i>	array(string)	0..1	The set of acceptable providers of Media EAS instances associated with this Provisioning Session. If empty, EAS instances from any provider are acceptable.
<i>easId</i>	string	0..1	The Application Identifier (e.g., in the form of a URI or Fully-Qualified Domain Name) of a set of EAS instances, or of a particular EAS instance associated with this Provisioning Session.
<i>easType</i>	string	0..1	The type of Media EAS instances associated with this Provisioning Session.
<i>easFeatures</i>	array(string)	0..1	Media EAS service features required to be supported by EAS instances associated with this Provisioning Session. If empty, Media EAS instances of the specified <i>easType</i> with any feature set are acceptable.
<i>serviceKpi</i>	EASServiceKPI	0..1	Media AS service characteristics required to be satisfied by EAS instances associated with this Provisioning Session. If omitted, Media EAS instances with any service characteristics are acceptable.
<i>serviceArea</i>	Geographical ServiceArea	0..1	The list of geographical areas that Media EAS instances associated with this Provisioning Session are required to serve. If omitted, Media EAS instances shall serve all geographical areas whenever possible.
<i>serviceAvailability Schedule</i>	array(Scheduled Communication Time)	0..1	The required availability schedule for Media EAS instances associated with this Provisioning Session. If omitted, Media EAS instances are required to be available at all times.
<i>serviceContinuity Scenarios</i>	array(ACRScenario)	0..1	The Application Context Relocation scenarios that Media EAS instances associated with this Provisioning Session are required to support for service continuity. If omitted Media EAS instances are not required to support service continuity across EAS relocation.
NOTE: Data types <i>ScheduledCommunicationTime</i> , <i>GeographicalServiceArea</i> , <i>EASServiceKPI</i> , and <i>ACRScenario</i> are defined in TS 29.558 [15].			

8.6.3.4 M1EASRelocationRequirements type

Table 8.6.3.4-1: Definition of M1EASRelocationRequirements type

Property name	Type	Cardinality	Description
<i>tolerance</i>	EASRelocation Tolerance	1..1	Indicates whether the Media EAS instance tolerates Application Context Relocation. (See clause 7.3.4.4.) If set to <i>RELOCATION_INTOLERANT</i> , the other properties in this data type shall be ignored.
<i>maxInterruption Duration</i>	UIntegerRm	0..1	The maximum downtime (expressed in milliseconds) that an application can tolerate during Media EAS relocation. If the expected downtime of the application is expected to exceed this duration, relocation of the Media EAS instance shall not be performed.
<i>maxResponseTime Difference</i>	UIntegerRm	0..1	The maximum allowed difference between the previously experienced average User Plane network latency to the source Media EAS instance and the expected latency to the target Media EAS instance, expressed in milliseconds.

8.7 Policy Templates provisioning API

8.7.1 Overview

The Policy Templates Provisioning API allows a Media Application Provider to configure a set of Policy Templates within the scope of a Provisioning Session that may subsequently be applied to downlink or uplink media delivery sessions belonging to that Media Application Provider using the Dynamic Policy API specified in clause 9.3. A Policy Template is used to specify the traffic shaping and charging policies to be applied to these media streaming sessions, as specified in clause 5.2.7.1.

8.7.2 Resource structure

The Policy Templates Provisioning API is accessible through the following URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 8.7.2-1 below specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the Provisioning Session identifier shall be substituted into *{provisioningSessionId}* in the above URL template and the sub-resource path specified in the second column shall be appended to the URL base path.

Table 8.7.2-1: Operations supported by the Policy Template Provisioning API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Create Policy Template	policy-templates	POST	Create a new Policy Template resource within the scope of a Provisioning Session.
Fetch Policy Template	policy-templates/{policyTemplateId}	GET	Retrieve an existing Policy Template resource.
Update Policy Template		PUT, PATCH	Modify the configuration of an existing Policy Template.
Destroy Policy Template		DELETE	Destroy an existing Policy Template resource.

8.7.3 Data model

8.7.3.1 PolicyTemplate resource

Table 8.7.3.1-1: Definition of PolicyTemplate resource

Property	Type	Cardinality	Usage	Description
<i>policyTemplateId</i>	ResourceId	1..1	C: RO R: RO U: RO	Resource identifier of this Policy Template assigned by the Media AF that is unique within the scope of the Provisioning Session.
<i>state</i>	string enum	1..1	C: RO R: RO U: 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 <i>READY</i> state may be instantiated as a Dynamic Policy Instance and applied to media streaming sessions.
<i>stateReason</i>	ProblemDetails	1..1	C: RO R: RO U: RO	Additional details about the current state of this Policy Template exposed to the Media Application Provider by the Media AF. The <i>instance</i> sub-property shall be present and shall indicate the URL of this Policy Template resource at reference point M1. The <i>title</i> sub-property shall be present and shall indicate a human-readable representation of the <i>state</i> property specified above, e.g., "Policy Template ready for use" or "Policy Template invalid". The <i>detail</i> sub-property shall be present and shall indicate a human-readable status/error message. All other properties shall be omitted.
<i>externalReference</i>	string	1..1	C: RW R: RW U: 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".
<i>applicationSessionContexts</i>	array(object)	0..1	C: RW R: RW U: RW	A set of application session contexts 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.
<i>sliceInfo</i>	Snssai	0..1	C: RW R: RW U: RW	A Network Slice on which this Policy Template may be instantiated. (See clause 5.4.4.2 of TS 29.571 [33].)
<i>dnn</i>	Dnn	0..1	C: RW R: RW U: RW	A Data Network on which this Policy Template may be instantiated. (See clause 7.3.2.)
<i>qoSSpecifications</i>	array(Policy Constraints)	0..1	C: RW R: RW U: RW	The network Quality of Service policy limits and other constraints to be applied to the application service component(s) of media delivery sessions that instantiate this Policy Template (see 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.
<i>chargingSpecification</i>	Charging Specification	0..1	C: RW R: RW U: 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).

Property	Type	Cardinality	Usage	Description
<i>bdtPolicyId</i>	BdtReferenceId	0..1	C: RW R: RO U: RW	A reference to an existing Background Data Transfer policy in the PCF (see NOTE 1). Mutually exclusive with <i>bdtSpecification</i> .
<i>bdtSpecification</i>	BdtPolicySchedule	0..1	C: RW R: RO U: 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 <i>bdtPolicyId</i> property.
<i>l4SEnablement Preference</i>	boolean	0..1	C: RW R: RO U: RW	If <i>true</i> , 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 <i>false</i> if omitted.
<i>qosMonitoring Configuration</i>	QosMonitoring Information	0..1	C: RW R: RO U: 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 <i>BdtReferenceId</i> is specified in TS 29.122 [20].				
NOTE 2: Data type <i>QosMonitoringInformation</i> is specified in TS 29.122 [20].				

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

8.7.3.2 BdtPolicySchedule type

Table 8.7.3.2-1: Definition of BdtPolicySchedule type

Property name	Type	Cardinality	Description
<i>startDate</i>	Date	0..1	The start date of the Background Data Transfer policy.
<i>endDate</i>	Date	0..1	The last date of the Background Data Transfer policy.
<i>windows</i>	array(object)	1..1	The windows when Background Data Transfers are permitted. The array shall contain at least one window specification.
<i>startTime</i>	TimeOfDay	0..1	The starting time of a Background Data Transfer window (see NOTE).
<i>duration</i>	DurationMin	0..1	The duration of the Background Data Transfer window in minutes with the maximum value of 1339 (see NOTE). The duration may result in a window ending on the next calendar day.
<i>daysInWeek</i>	array(DayOfWeek)	0..1	The days of the week that the Background Data Transfer window is in effect. A maximum of seven occurrences can be provided. No two occurrences of array shall have the same value. If omitted, the Background Data Transfer window is applicable on all days of the week.
<i>numberOfOccurrences</i>	integer	0..1	The number of days that the Background Data Transfer window is in effect. Each <i>daysInWeek</i> recurrence is counted as one occurrence. The Background Data Transfer specification ends when either the <i>endDate</i> or the <i>numberOfOccurrences</i> is reached, whichever sooner.
<i>numberOfUes</i>	integer	0..1	The maximum number of UEs permitted to use the Background Data Transfer policy in each occurrence of the Background Data Transfer window. Minimum value: 1.
<i>estimatedDataVolumePerUe</i>	UsageThreshold	0..1	An estimate of the data volume an average UE is expected to transfer (in both the downlink and uplink directions) when applying this Background Data Transfer policy in each occurrence of the Background Data Transfer window (see NOTE).
<i>aggregateDownlinkBitRateLimit</i>	BitRate	0..1	A limit on the total uplink bit rate of concurrent instances of the parent Policy Template to be enforced by the Media AF.
<i>aggregateUplinkBitRateLimit</i>	BitRate	0..1	A limit on the total downlink bit rate of concurrent instances of the parent Policy Template to be enforced by the Media AF.

NOTE: Data types *TimeOfDay*, *DurationMin*, *DayOfWeek* and *UsageThreshold* are defined in TS 29.122 [20].

8.8 Content Hosting provisioning API

8.8.1 Overview

This clause specifies the API that a Media Application Provider uses by interacting with a Media AF at reference point M1 to provision and manage Media AS Content Hosting Configurations for downlink media delivery. Each such configuration is represented by a *ContentHostingConfiguration*, the data model for which is specified in clause 8.8.3 below. The RESTful resources for managing Content Hosting Configurations are specified in clause 8.8.2 and the operations on these resources are further elaborated in clause 5.2.8.

8.8.2 Resource structure

The Content Hosting Provisioning API is accessible through this URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 8.8.2-1 below specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the Provisioning Session identifier shall be substituted into *{provisioningSessionId}* in the above URL template and the sub-resource path specified in the second column shall be appended to the URL base path.

Table 8.8.2-1: Operations supported by the Content Hosting Provisioning API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Create Content Hosting Configuration	content-hosting-configuration	POST	Create the Content Hosting Configuration resource within the context of a parent Provisioning Session.
Retrieve Content Hosting Configuration		GET	Retrieve an existing Content Hosting Configuration resource.
Update Content Hosting Configuration		PUT, PATCH	Modify an existing Content Hosting Configuration resource.
Destroy Content Hosting Configuration		DELETE	Destroy an existing Content Hosting Configuration resource.
Purge Content Hosting Configuration cache	content-hosting-configuration/purge	POST	Invalidate some or all cached media resources associated with the specified Content Hosting Configuration.

8.8.3 Data model

8.8.3.1 ContentHostingConfiguration resource

Table 8.8.3.1-1: Definition of ContentHostingConfiguration resource

Property name	Data Type	Cardinality	Description
<i>name</i>	string	1..1	A name for this Content Hosting Configuration.
<i>ingestConfiguration</i>	IngestConfiguration	1..1	Parameters for ingesting media content into the Media AS at reference point M2 or M10.
<i>mode</i>	ContentTransferMode	1..1	Indicates whether media content is pulled by the Media AS from the Media Application Provider's origin server at reference point M2 or from another Media AS at reference point M10, or else pushed into the Media AS by the Media Application Provider at reference point M2 or from another Media AS at reference point M10 (see clause 7.3.4.5).
<i>protocol</i>	Uri	1..1	A fully-qualified term identifier URL that identifies the content ingest protocol. The controlled vocabulary of content ingest protocols is specified in clause 8 of TS 26.512 [6].
<i>baseURL</i>	AbsoluteUrl	0..1	A base URL (i.e., one that includes a scheme, authority and, optionally, path segments) from which content is ingested by the Media AS at reference point M2 or M10 for this ingest configuration. - In the case of pull-based content ingest (<i>mode</i> is set to <i>PULL</i>), the base URL shall be provided to the Media AF by the Media Application Provider to indicate the location from which content is to be pulled. A request to a reference point M4 service location is mapped by the Media AS to a URL at reference point M2 or M10 whose base is the value of this property. - In the case of push-based content ingest (<i>mode</i> is set to <i>PUSH</i>), this property shall be populated by the Media AF and returned to the Media Application Provider to indicate the base URL to which content for this Content Hosting Configuration is to be published.
<i>distributionConfigurations</i>	array(Distribution Configuration)	1..1	Specifies the distribution method and configuration for the ingested content. The array shall contain at least one member. Hence, more than one distribution may be configured for the same ingested content, e.g. to offer different distribution configurations such as DASH and HLS, or to expose multiple service locations at reference point M4 or M10.
<i>distributionId</i>	string	1..1	An identification label, unique within the scope of this Content Hosting Configuration, that can be referenced by other resources in the Provisioning Session. The value is nominated by the Media Application Provider.
<i>mode</i>	ContentTransferMode	0..1	Indicates whether media content is: - pulled from the Media AS by a Media Access Client at reference point M4 or from another Media AS at reference point M10; or - pushed by the Media AS into a downstream Media AS at reference point M10. Default value if omitted: <i>PULL</i> .
<i>affinityGroup</i>	string	0..1	The Media Application Provider may assign an affinity group label indicating that the physical endpoint(s) of the reference point M4 service location exposed by this distribution configuration are to be deployed alongside those of service locations exposed by other distribution configurations declared in this Content Hosting Configuration with the same affinity group label. The physical endpoint(s) of service locations exposed by distribution configurations with different affinity group labels are intended to be deployed at mutually resilient network locations. If this property is omitted, deployment of physical endpoint(s) for the service location of this distribution configuration is at the discretion of the Media AF.

<i>supplementaryDistributionNetworks</i>	array(<DistributionNetworkType, DistributionMode>	0..1	Indicates that the content for this distribution configuration is also to be distributed via one or more supplementary networks. Each member of the array is a duple mapping a type of distribution network to a mode of distribution. The same <i>DistributionNetworkType</i> value shall appear at most once in this array.
<i>edgeResourcesConfigurationId</i>	ResourceId	0..1	A reference to an Edge Resources Configuration resource (see clause 8.6.2). When present, indicates that the Media AS supporting this content distribution shall be realised as a set of one or more EAS instances configured per the referenced resource.
<i>contentPreparationTemplateId</i>	ResourceId	0..1	A reference to a Content Preparation Template resource (see clause 8.5.2). Indicates that the referenced content preparation is required prior to distribution.
<i>certificateId</i>	ResourceId	0..1	A reference to a Server Certificate resource (see clause 8.4.3.2). When content is distributed using TLS [29], the referenced X.509 [10] certificate for the origin domain is presented by the Media AS in the TLS handshake at reference point M4 or M10. This attribute indicates the identifier of the certificate to use. - In the case of pull-based content distribution (content distribution <i>mode</i> is set to <i>PULL</i>), the referenced certificate shall be presented as a server certificate to the Media Client at reference point M4 or to the downstream Media AS at reference point M10. - In the case of push-based content distribution to a downstream Media AS (content distribution <i>mode</i> is set to <i>PUSH</i>), the referenced certificate shall be presented as a client certificate to the downstream Media AS at reference point M10.
<i>canonicalDomainName</i>	string	0..1	All resources exposed from the service location at reference point M4 or M10 shall be accessible through this default Fully-Qualified Domain Name. - In the case of pull-based content distribution at reference point M4 or M10 (content distribution <i>mode</i> is set to <i>PULL</i>), the value shall be assigned by the Media AF. - In the case of push-based content distribution to a downstream Media AS at reference point M10 (content distribution <i>mode</i> is set to <i>PUSH</i>), this property shall not be populated because the Media AS acts as the pushing client in this case.
<i>domainNameAlias</i>	string	0..1	The Media Application Provider may assign another Fully-Qualified Domain Name (FQDN) through which media resources within the scope of this distribution configuration are additionally accessible from the Media AS from the reference point M4 service location. This domain name is used by the Media AS to set appropriate CORS HTTP response headers sent from the reference point M4 service location. If this property is present, the Media Application Provider is responsible for providing in the DNS a <i>CNAME</i> record that resolves <i>domainNameAlias</i> to <i>canonicalDomainName</i> . If the <i>certificateId</i> property is also present in this distribution configuration, the provided domain name alias shall match one of the <i>subjectAltName</i> extension fields in the referenced Server Certificate resource, allowing for wildcard matching. This property shall be omitted if content distribution <i>mode</i> is set to <i>PUSH</i> because the Media AS acts as the pushing client in this case.
<i>baseURL</i>	AbsoluteUrl	1..1	A service location base URL (i.e., one that includes a scheme, authority and, optionally, path segments) from which content is made available to Media Clients at reference point M4 or to another Media AS at reference point M10 for this distribution configuration. - In the case of pull-based content distribution at reference point M4 or M10 (content distribution <i>mode</i> is set to <i>PULL</i>), the value is chosen by the Media AF when the Content Hosting Configuration is provisioned. It is an error for the Media Application Provider to set this.

				- In the case of push-based content distribution to a downstream Media AS at reference point M10 (content distribution <i>mode</i> is set to <i>PUSH</i>), this property shall be populated by the Media Application Provider with a base URL previously nominated by the Media AF managing that downstream Media AS.
	<i>entryPoint</i>	RelativeMediaEntryPoint	0..1	The Media Entry Point nominated by the Media Application Provider for this distribution configuration when it is used to describe a single content item and/or streaming session configuration (see clauses 5.2.8.2 and 7.3.3.12). This property may be omitted when this distribution configuration describes multiple content items or streaming session configurations. This property shall be omitted if content distribution <i>mode</i> is set to <i>PUSH</i>.
	<i>relativePath</i>	RelativeUrl	1..1	A relative path (i.e., without a scheme or any leading forward slash characters) to the Media Entry Point document resource. The semantics are dependent on the value of <i>ingestConfiguration.protocol</i>. The path shall be valid at reference point M2 or M10 when appended to the ingest base URL and at reference point M4 when appended to the service location distribution base URL.
	<i>contentType</i>	string	1..1	The MIME content type of the Media Entry Point. Used by the Media Client to select a Media Entry Point.
	<i>protocol</i>	Uri	0..0	This property shall not be present in a distribution configuration.
	<i>profiles</i>	array(Uri)	0..1	An optional list of conformance profile identifiers associated with the Media Entry Point, each one expressed as a URI. A profile URI may indicate an interoperability point, for example. Used by the Media Client to select a Media Entry Point. If present, the array shall contain at least one item.
	<i>pathRewriteRules</i>	array(PathRewriteRule)	0..1	An ordered list of rules for rewriting the request URL paths of media resource requests handled by the Media AS at reference point M4 service location and translating them to URL paths at reference point M2 or M10. If multiple rules match a particular resource's path, only the first matching rule, in order of appearance in this array, shall be applied. If present, the array shall have at least one member.
	<i>requestPathPattern</i>	string	1..1	A regular expression [36] against which the path part of each Media AS request URL, including the leading "/", and up to and including the final "/", shall be compared. (Any leaf path element following the final "/" shall be excluded from this comparison.) In the case of pull-based content ingest, the M4 download request path is used in the comparison. In the case of push-based content ingest, the M2 or M10 upload request path is used in the comparison. In either case, if the request path matches this pattern, the path mapping specified in the corresponding <i>mappedPath</i> shall be applied.
	<i>mappedPath</i>	string	1..1	A replacement for the portion of the Media AS request path that matches <i>requestPathPattern</i>. In the case of pull-based content ingest, <i>ingestConfiguration.entryPoint</i> is concatenated with the mapped path and any leaf path element from the original M4 download request to form the M2 or M10 origin request URL. In the case of push-based content ingest, <i>canonicalDomainName</i> (and, optionally, <i>domainName Alias</i>) are concatenated with the mapped path and any leaf path element from the original M2 or M10 upload request to form the service location distribution URL(s) exposed at reference point M4 or M10.

	<i>cacheConfigurations</i>	array(Caching Configuration)	0..1	A set of configurations of the Media AS content cache nominated by the Media Application Provider, each one affecting a matching subset of media resources ingested in relation to this Content Hosting Configuration. (See clause 7.3.3.13.) If present, the array shall have at least one member.
	<i>urlPatternFilter</i>	string	1..1	A pattern used to match media resource URLs at reference point M2 or M10 to determine whether a given media resource ingested by the Media AS is eligible to be cached by it. The format of the pattern shall be a regular expression as specified in [36].
	<i>cacheDirectives</i>	object	1..1	If a <i>urlPatternFilter</i> applies to a resource, then the provided <i>cacheDirectives</i> shall be applied by the Media AS to resources served through the reference point M4 or M10 service location, potentially overwriting any origin caching directives provided by the Media Application Provider when that resource is ingested at reference point M2 or M10.
	<i>statusCodeFilters</i>	array(integer)	0..1	The set of HTTP origin response status codes at reference point M2 or M10 to which these <i>cacheDirectives</i> apply. If the property is present, the array shall contain at least one item. If absent, the enclosing <i>cacheDirectives</i> shall apply to all HTTP origin response status codes.
	<i>noCache</i>	boolean	0..1	If set to <i>true</i> , indicates that the media resources matching the filters shall be marked by the Media AS as not to be cached when it serves such media resources from a reference point M4 service location. Default value if omitted: <i>false</i> .
	<i>maxAge</i>	uint32	0..1	The caching time-to-live period, expressed in seconds, of ingested media resources matching the filters. This determines the minimum period for which the Media AS shall cache matching media resources. If <i>noCache</i> is <i>false</i> , it also determines the time-to-live period signalled by the Media AS at reference point M4 service locations when it serves such media resources. The time-to-live for a given media resource shall be calculated relative to the time it was ingested by the Media AS. If <i>noCache</i> is <i>false</i> or omitted, ingested media resources shall be cached until the caching time-to-live period has been exceeded (if <i>maxAge</i> is present), indefinitely until the Content Hosting Configuration is destroyed by the Media Application Provider (if <i>maxAge</i> is omitted), until the Media Application Provider purges the cache, or until the available caching resources in the Media AS are exhausted, whichever is sooner.
	<i>geoFencing</i>	object	0..1	Directives limiting access to the content to the indicated geographic areas (see NOTE 1).
	<i>locatorType</i>	Uri	1..1	The type of the members of the <i>locators</i> array shall be indicated using a fully-qualified term identifier URI from the controlled vocabulary specified in clause B.1, or else from a vendor-specific vocabulary.
	<i>locators</i>	array(string)	1..1	Array of locators from which access to the resources is to be allowed. The format of the locator strings shall be determined by the semantics of the term identifier indicated in <i>locatorType</i> .
	<i>urlSignature</i>	object	0..1	Defines the URL signing scheme to be enforced by the Media AS at the reference point M4 service location (see NOTE 2). When present, only correctly signed and valid URLs are permitted to access the content resources within the scope of the enclosing distribution configuration.
	<i>urlPattern</i>	string	1..1	A pattern that shall be used by the Media AS to match M4 media resource request URLs. The Media AS shall not serve a matching media resource from the reference point M4 service location unless it includes a valid authentication token calculated over the portion of the M4 request URL that matches this pattern. The format of the pattern shall be a regular expression as specified in [36].
	<i>tokenName</i>	string	1..1	The name of the query parameter that the Media Access Function shall use to present the authentication token in the M4 request URL when required to do so.

	<i>passphraseName</i>	string	1..1	The name of the token parameter to be used to refer to the passphrase when constructing the M4 authentication token.
	<i>passphrase</i>	string	1..1	A string of between 6 and 50 characters to be used as the shared secret between the Media Application Provider and the Media AS for this <i>DistributionConfiguration</i> . (This secret is used in the computation and verification of the M4 authentication token but is never sent in the cleartext part of the M4 request URL.)
	<i>tokenExpiryName</i>	string	1..1	The name of the token parameter to be used to refer to the token expiry time point when constructing the M4 authentication token. The name of the query parameter that the Media Access Function shall use to present the token expiry time point in the cleartext part of the M4 request URL.
	<i>useIPAddress</i>	boolean	1..1	If set to <i>true</i> , the IP address of the Media Access Function is included in the computation of the authentication token for resources that match <i>urlPattern</i> and access to matching media resources shall be allowed by the Media AF only when the M4 request is made from this IP address.
	<i>ipAddressName</i>	string	0..1	The name of the token parameter that is encoded as part of the M4 authentication token if the <i>useIPAddress</i> flag is set to <i>true</i> . (The IP address is not passed in the cleartext part of the M4 request URL.)
NOTE 1: The geofencing feature used to restrict content requests to the Media AS at reference point M4 is specified in clause 7.6.4.6 of TS 26.512 [6].				
NOTE 2: The format of the authentication token used to sign content requests to the Media AS at reference point M4 service locations is specified in clause 7.6.4.5 of TS 26.512 [6].				

8.8.3.2 DistributionNetworkType enumeration

Table 8.8.3.2-1: Definition of DistributionNetworkType enumeration

Enumeration value	Description
<i>DISTRIBUTION_NETWORK_EMBMS</i>	Downlink media streaming via eMBMS.
<i>DISTRIBUTION_NETWORK_MBS</i>	Downlink media streaming via MBS.

8.8.3.3 DistributionMode enumeration

Table 8.8.3.3-1: Definition of DistributionMode enumeration

Enumeration value	Description
<i>MODE_EXCLUSIVE</i>	Content ingested by the Media AS is distributed exclusively via a supplementary network and is not available at reference point M4.
<i>MODE_HYBRID</i>	Content ingested by the Media AS is available at reference point M4 and is additionally distributed via a supplementary network.
<i>MODE_DYNAMIC</i>	Content ingested by the Media AS is available at reference point M4 and is additionally distributed via a supplementary network only when reported client demand exceeds a configured threshold.

8.9 Content Publishing provisioning API

8.9.1 Overview

This clause specifies the API that a Media Application Provider uses with a Media AF at reference point M1 to provision and manage Media AS Content Publishing Configurations for uplink media delivery. Each such configuration is represented by a *ContentPublishingConfiguration*, the data model for which is specified in clause 8.9.3 below. The RESTful resources for managing Content Publishing Configurations are specified in clause 8.9.2 and the operations on these resources are further elaborated in clause 5.2.9.

8.9.2 Resource structure

The Content Publishing Provisioning API is accessible through this URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 8.9.2-1 below specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the Provisioning Session identifier shall be substituted into *{provisioningSessionId}* in the above URL template and the sub-resource path specified in the second column shall be appended to the URL base path.

Table 8.9.2-1: Operations supported by the Content Publishing Provisioning API

Operation	Sub-resource path	Allowed HTTP method(s)	Description
Create Content Publishing Configuration	content-publishing-configuration	POST	Create the Content Publishing Configuration resource within the context of a parent Provisioning Session.
Retrieve Content Publishing Configuration		GET	Retrieve an existing Content Publishing Configuration resource.
Update Content Publishing Configuration		PUT, PATCH	Modify an existing Content Publishing Configuration resource.
Destroy Content Publishing Configuration		DELETE	Destroy an existing Content Publishing Configuration resource.
Purge Content Publishing Configuration cache	content-publishing-configuration/purge	POST	Invalidate some or all cached media resources associated with the specified Content Publishing Configuration. Applicable to pull-based content egest only.

8.9.3 Data model

8.9.3.1 ContentPublishingConfiguration resource

Table 8.9.3.1-1: Definition of ContentPublishingConfiguration resource

Property name	Data type	Cardinality	Description
<i>name</i>	string	1..1	A name for this Content Publishing Configuration.
<i>contributionConfigurations</i>	array(Contribution Configuration)	1..1	Specifies the Media Entry Point and content preparation required for the egested content. The array shall contain at least one member. Hence, more than one contribution may be configured for different content types.
<i>contributionId</i>	string	1..1	An identification label, unique within the scope of this Content Publishing Configuration, that can be referenced by other resources in the Provisioning Session. The value is nominated by the Media Application Provider.
<i>mode</i>	ContentTransferMode	0..1	Indicates whether media content is: - Pushed to the Media AS by a Media Access Client to the Media AS at reference point M4 or from another Media AS at reference point M10; or - Pulled from a downstream Media AS at reference point M10. Default value if omitted: <i>PUSH</i> .
<i>affinityGroup</i>	string	0..1	The Media Application Provider may assign an affinity group label indicating that the physical endpoint(s) of the reference point M4 service location exposed by this contribution configuration are to be deployed alongside those of service locations exposed by other contribution configurations declared in this Content Publishing Configuration with the same affinity group label. The physical endpoint(s) of service locations exposed by contribution configurations in this Content Publishing Configuration with different affinity group labels are intended to be deployed at mutually resilient network locations. If this property is omitted, deployment of physical endpoint(s) for the service location of this contribution configuration is at the discretion of the Media AF.
<i>edgeResources ConfigurationId</i>	ResourceId	0..1	A reference to an Edge Resources Configuration resource (see clause 8.6.2). When present, indicates that the Media AS supporting this content contribution shall be realised as a set of one or more EAS instances configured per the referenced resource.
<i>contentPreparation TemplateId</i>	ResourceId	0..1	A reference to a Content Preparation Template resource (see clause 8.5.2). Indicates that the referenced content preparation is required prior to egest.
<i>certificateId</i>	ResourceId	0..1	A reference to a Server Certificate resource (see clause 8.4.3.2). When content is contributed using TLS [29], the referenced X.509 [10] certificate for the origin domain is presented by the Media AS in the TLS handshake at reference point M4. This attribute indicates the identifier of the certificate to use. - In the case of push-based content contribution (content contribution <i>mode</i> is set to <i>PUSH</i>), the referenced certificate shall be presented as a server certificate to the contributing Media Client at reference point M4 or to the downstream contributing Media AS at reference point M10. - In the case of pull-based content contribution (content contribution <i>mode</i> is set to <i>PULL</i>), the referenced certificate shall be presented as a client certificate to the downstream contributing Media AS at reference point M10.

	<i>canonicalDomainName</i>	string	0..1	All resources exposed from the service location at reference points M4 and M10 shall be accessible through this default Fully-Qualified Domain Name. - In the case of push-based content contribution at reference point M4 or M10 (content contribution <i>mode</i> is set to <i>PUSH</i>), this property shall be assigned by the Media AF. - In the case of pull-based content contribution from a downstream contributing Media AS at reference point M10 (content contribution <i>mode</i> is set to <i>PULL</i>), this property shall be omitted because the Media AS acts as the pulling client in this case.
	<i>domainNameAlias</i>	string	0..1	The Media Application Provider may assign another Fully-Qualified Domain Name (FQDN) through which media resources within the scope of this contribution configuration are additionally accessible from the Media AS from the reference point M4 service location. This domain name is used by the Media AS to set appropriate CORS HTTP response headers at the reference point M4 service location. If this property is present, the Media Application Provider is responsible for providing in the DNS a <i>CNAME</i> record that resolves <i>domainNameAlias</i> to <i>canonicalDomainName</i>. If the <i>certificateId</i> property is also present in this contribution configuration, the provided domain name alias shall match one of the <i>subjectAltName</i> extension fields in the referenced Server Certificate resource, allowing for wildcard matching. This property shall be omitted if content distribution <i>mode</i> is set to <i>PULL</i> because the Media AS acts as the pulling client in this case.
	<i>baseURL</i>	AbsoluteUrl	1..1	A service location base URL (i.e. one that includes a scheme, authority, and, optionally, path segments) to which content is contributed by Media Clients at reference point M4 or by another Media AS at reference point M10 for this contribution configuration. - In the case of push-based content contribution at reference point M4 or M10 (content contribution <i>mode</i> is set to <i>PUSH</i>), the value is nominated by the Media AF when the Content Publishing Configuration is provisioned. It is an error for the Media Application Provider to set this. - In the case of pull-based content contribution from a downstream contributing Media AS at reference point M10 (content contribution <i>mode</i> is set to <i>PULL</i>), this property shall be populated by the Media Application Provider with a content egest base URL previously nominated by the Media AF managing that downstream Media AS.
	<i>entryPoint</i>	RelativeMediaEntryPoint	0..1	The Media Entry Point for this contribution configuration (see clauses 5.2.9.2 and 7.3.3.12). The value is nominated by either the Media AF or the Media Application Provider. In the case where service chaining is in use via reference point M10, the value may have been nominated by another Media AF.
	<i>relativePath</i>	RelativeUrl	1..1	A relative path (i.e., without a scheme or any leading forward slash characters) for this Media Entry Point which may point to a document resource. Nominated by the Media AF.
	<i>contentType</i>	string	1..1	The MIME content type of this Media Entry Point. This property shall be mutually exclusive with <i>protocol</i>. Used by the Media Client to select a contribution configuration. Nominated by the Media Application Provider.
	<i>protocol</i>	Uri	1..1	A fully-qualified term identifier URI that identifies the media contribution protocol used at the reference point M4 service location for this Media Entry Point. This property shall be mutually exclusive with <i>contentType</i>. Nominated by the Media Application Provider.

					The controlled vocabulary of media contribution protocols is specified in clause 10 of TS 26.512 [6].
		<i>profiles</i>	array(Uri)	0..1	An optional list of conformance profile identifiers associated with this Media Entry Point, each one expressed as a URI. A profile URI may indicate an interoperability point, for example. Used by the Media Client to select a contribution configuration. Nominated by the Media Application Provider and, if present, the array shall contain at least one item.
		<i>egestConfiguration</i>	EgestConfiguration	1..1	Parameters for egesting media content from the Media AS at reference point M2 or M10.
		<i>mode</i>	ContentTransferMode	1..1	Indicates whether content is pulled from the Media AS by the Media Application Provider at reference point M2 or from another Media AS at reference point M10, or else pushed to the Media Application Provider by the Media AS at reference point M2 or to another Media AS at reference point M10 (see clauses 5.2.8.2 and 7.3.4.5). Nominated by the Media Application Provider.
		<i>protocol</i>	Uri	1..1	A fully-qualified term identifier URI that identifies the content egest protocol. Nominated by the Media Application Provider. The controlled vocabulary of content egest protocols is specified in clause 8 of TS 26.512 [6].
		<i>baseURL</i>	AbsoluteURL	0..1	A base URL (i.e., one that includes a scheme, authority, and, optionally, path segments) to which content is published at reference point M2 or M10 for this publishing configuration. - In the case of pull-based content egest (<i>mode</i> is set to <i>PULL</i>), this property shall be populated by the Media AF to indicate the location on the Media AS from which content is to be pulled. An uplink media streaming request received at reference point M4 service location is mapped by the Media AS to a URL at reference point M2 or M10 whose base is the value of this property. - In the case of push-based content egest (<i>mode</i> is set to <i>PUSH</i>), this property shall be provided to the Media AF by the Media Application Provider and indicates the base URL to which content for this Content Publishing Configuration is to be published.
		<i>entryPoint</i>	RelativeMediaEntryPoint	0..1	The Media Entry Point for content egest used by the Media Application Provider at reference point M2 or M10. In the case of pull-based content egest (<i>mode</i> is set to <i>PULL</i>), this object shall be provided by the Media AF. In the case of push-based content egest (<i>mode</i> is set to <i>PUSH</i>), this object may be provided by the Media Application Provider or an upstream Media AF in the case service chaining is in use via reference point M10. The semantics of the entry point are dependent on the value of the <i>contentType</i> property.
		<i>relativePath</i>	RelativeURL	1..1	A relative path (i.e., without a scheme or any leading forward slash characters) to the Media Entry Point document resource. Nominated by the Media AF for pull-based content egest. Nominated by the Media Application Provider for Push-based content egest.
		<i>contentType</i>	string	1..1	The MIME content type of this Media Entry Point. Nominated by the Media Application Provider.
		<i>protocol</i>	Uri	1..1	A fully-qualified term identifier URI that identifies the media egest protocol at reference point M2 for this Media Entry Point. This property shall be mutually exclusive with <i>contentType</i> . Nominated by the Media Application Provider. The controlled vocabulary of media contribution protocols is specified in clause 10 of TS 26.512 [6].

		<i>profiles</i>	array(Uri)	0..1	An optional list of conformance profile identifiers associated with this Media Entry Point, each one expressed as a URI. A profile URI may indicate an interoperability point, for example. Nominated by the Media Application Provider and, if present, the array shall contain at least one item.
		<i>cachingConfigurations</i>	array(Caching Configuration)	0..1	A set of configurations of the Media AS cache nominated by the Media Application Provider, each one affecting a matching subset of media resources intended for pull-based egest at reference point M2 or M10 in relation to this Content Publishing Configuration. (See clause 7.3.3.13.) Applicable only for pull-based content egest (<i>mode</i> is set to <i>PULL</i>). For Push-based egest (<i>method</i> is set to <i>PUSH</i>), this property shall not be present. If present, the array shall have at least one member.
		<i>urlPatternFilter</i>	string	1..1	A pattern used to match media resource URLs to determine whether a given media resource is eligible for caching by the Media AS. The format of the pattern shall be a regular expression as specified in [36].
		<i>cachingDirectives</i>	object	1..1	If a <i>urlPatternFilter</i> applies to a resource, then the provided <i>cachingDirectives</i> shall be applied by the Media AS at reference point M2 or M10. Any caching directives set by the Media Streamer on content contributed at a reference point M4 service location which define a shorter lifetime for the content shall take precedence over these parameters.
		<i>statusCodeFilters</i>	array(integer)	0..1	The set of Media AS response status codes at reference point M2 or M10 to which these <i>cachingDirectives</i> apply. If the property is present, the array shall contain at least one item. If absent, the enclosing <i>cachingDirectives</i> shall apply to all Media AS responses.
		<i>noCache</i>	boolean	0..1	If set to <i>true</i> , this indicates that the media resources matching the filters shall be marked by the Media AS as not to be cached when it serves such media resources at reference point M2 or M10. Default value if omitted: <i>false</i> .
		<i>maxAge</i>	uint32	0..1	The caching time-to-live period, expressed in seconds, of media resources matching the filters. This determines the minimum period for which the Media AS shall cache matching media resources. If <i>noCache</i> is <i>false</i> , it also determines the time-to-live period signalled by the Media AS at reference point M2 or M10 when it serves such media resources. The time-to-live for a given media resource shall be calculated relative to the time it was contributed to the Media AS. If <i>noCache</i> is <i>false</i> or omitted, ingested media resources shall be cached until the caching time-to-live period has been exceeded (if <i>maxAge</i> is present), indefinitely until the Content Publishing Configuration is destroyed by the Media Application Provider (if <i>maxAge</i> is omitted), until the Media Application Provider purges the cache, or until the available caching resources in the Media AS are exhausted, whichever is sooner.

8.10 Real-time Media Communication provisioning API

8.10.1 Overview

The Real-time Media Communication provisioning API is used by the Media Application Provider to supply configuration information, in the form of an *RTCConfiguration* resource (specified in clause 8.10.3) that is used by the Media Client to gain access to real-time media communication (RTC) functionality of the Media AS. The provisioning API allows for the enablement and/or advertisement of ICE (STUN, TURN, and/or SWAP) services to facilitate communication between Media Clients in an RTC-based media delivery session. These facilitation services may either be provided by the Media AS itself or provisioned by the Media AF.

8.10.2 Resource structure

The RTC Configuration API is accessible through this URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 8.10.2-1 below specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the Provisioning Session identifier shall be substituted into *{provisioningSessionId}* in the above URL template and the sub-resource path specified in the second column shall be appended to the URL base path.

Table 8.10.2-1: Operations supported by the Real-Time Communication Configuration API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Create RTC Configuration	rtc-configuration	POST	Create the RTC Configuration resource within the context of a parent Provisioning Session.
Retrieve RTC Configuration		GET	Retrieve an existing RTC Configuration resource.
Update RTC Configuration		PUT, PATCH	Modify an existing RTC Configuration resource.
Destroy RTC Configuration		DELETE	Destroy an existing RTC Configuration resource.

8.10.3 Data model

8.10.3.1 RTCConfiguration resource

Table 8.10.3.1-1: Definition of RTCConfiguration resource

Property name	Data Type	Cardinality	Description
<i>edgeResourcesConfigurationId</i>	ResourceId	0..1	A reference to an Edge Resources Configuration resource (see clause 8.6.2). When present, indicates that the Media AS supporting this RTC Configuration shall be realised as a set of one or more EAS instances configured per the referenced resource.
<i>enableStunService</i>	boolean	0..1	If <i>true</i> , the Media AS shall provide a STUN service to the Media Session Handler for use in RTC-based media delivery sessions initiated in the context of the parent Provisioning Session. If <i>false</i> the Media Application Provider may populate the <i>stunEndpoints</i> property. If omitted, the default value shall be <i>false</i> .
<i>stunEndpoints</i>	array(Service EndpointAccess Specification)	0..1	A list of one or more trusted STUN server endpoints populated by the Media Application Provider or else by the Media AF that may be used as ICE candidates for RTC-based media delivery sessions.
<i>enableTurnService</i>	boolean	0..1	If <i>true</i> , the Media AS shall provide a TURN service to the Media Session Handler for use in RTC-based media delivery sessions initiated in the context of the parent Provisioning Session. If <i>false</i> the Media Application Provider may populate the <i>turnEndpoints</i> property. If omitted, the default value shall be <i>false</i> .
<i>turnEndpoints</i>	array(Service EndpointAccess Specification)	0..1	A list of one or more trusted TURN server endpoints populated by the Media Application Provider or else by the Media AF that may be used as ICE candidates for RTC-based media delivery sessions.
<i>enableSwapService</i>	boolean	0..1	If <i>true</i> , the Media AS shall provide a SWAP service to the Media Session Handler for use in RTC-based media delivery sessions initiated in the context of the parent Provisioning Session. If <i>false</i> the Media Application Provider may populate the <i>swapEndpoints</i> property. If omitted, the default value shall be <i>false</i> .
<i>swapEndpoints</i>	array(Service EndpointAccess Specification)	0..1	A list of one or more trusted WebRTC Signalling Server endpoints populated by the Media Application Provider or else by the Media AF that support the SWAP protocol that may be used by the application for RTC-based media delivery sessions in the context of the parent Provisioning Session.

8.10.3.2 ServiceEndpointAccessSpecification

This data type is derived by extension from *EndpointAddress* (see clause 7.3.3.11).

Table 8.10.3.2-1: Definition of ServiceEndpointAccessSpecification data type

Property name	Data Type	Cardinality	Description
<i>domainName</i>	string	1..1	The Fully-Qualified Domain Name of this service endpoint.
<i>portNumbers</i>	array(UInt16)	1..1	A list of listening ports over which the service is accessible (e.g. STUN servers must offer two listening ports). The array shall contain at least one member.
<i>credentials</i>	object	0..1	Authentication information to be presented to this service endpoint by all clients.
<i>username</i>	string	1..1	A username that is authorized to access the server.
<i>passphrase</i>	string	1..1	The passphrase associated with <i>username</i> .
<i>certificateId</i>	ResourceId	0..1	Identifies the server certificate resource to be presented to Media Clients by this service endpoint.

8.11 Metrics Reporting provisioning API

8.11.1 Overview

The Metrics Reporting Provisioning API allows a Media Application Provider to configure the Metrics Collection and Reporting procedure for a particular downlink or uplink media delivery Provisioning Session at reference point M1.

8.11.2 Resource structure

The Metrics Reporting Provisioning API is accessible through the following URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 8.11.2-1 below specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the Provisioning Session identifier shall be substituted into *{provisioningSessionId}* in the above URL template and the sub-resource path specified in the second column of the table shall be appended to the URL base path.

Table 8.11.2-1: Operations supported by the Metrics Reporting Provisioning API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Create Metrics Reporting Configuration	metrics-reporting-configurations	POST	Create and provide a metrics reporting configuration.
Read Metrics Reporting Configuration	metrics-reporting-configurations/ <i>{metricsReportingConfigurationId}</i>	GET	Retrieve the values of an existing Metrics Reporting Configuration.
Update Metrics Reporting Configuration		PUT, PATCH	Modify or replace an existing metrics reporting configuration.
Destroy Metrics Reporting Configuration		DELETE	Destroy a metrics reporting configuration.

8.11.3 Data model

8.11.3.1 MetricsReportingConfiguration resource

Table 8.11.3-1: Definition of MetricsReportingConfiguration resource

Property name	Type	Cardinality	Description
<i>metricsReportingConfigurationId</i>	ResourceId	1..1	An identifier for this Metrics Reporting Configuration assigned by the Media AF when the resource is created that is unique within the scope of the enclosing Provisioning Session.
<i>sliceScope</i>	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 1). 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.
<i>scheme</i>	Uri	0..1	The QoE metrics scheme associated with this Metrics Reporting Configuration which indicates the required format of metrics reports. 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]. Omitting this property signals to the Media AF that metrics reporting is currently disabled for the Provisioning Session in question.
<i>dataNetworkName</i>	Dnn	0..1	Identifies the Data Network which shall be used when sending metrics reports. If not specified, the default Data Network shall be used.
<i>reportingStartOffset</i>	DurationSec	0..1	The time offset (expressed in seconds) from the start of a media delivery session when the Media Client is required to begin submitting metrics reports. The value shall not be negative. 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.
<i>reportingDuration</i>	DurationSec	0..1	The period of time (expressed in seconds) measured relative to the reporting start point, after which the Media Client is required to stop reporting metrics. The value shall not be negative. If set to zero, a single report shall be sent at <i>reportingStartOffset</i> . If omitted, reporting is required to continue until the end of the media delivery session.
<i>reportingInterval</i>	DurationSec	0..1	The time interval between successive metrics reports to be sent by the Media Session Handler. The value shall be greater than zero. If not specified, a single final report shall be sent after the media delivery session has ended.
<i>samplePercentage</i>	Percentage	0..1	The proportion of media delivery sessions for which QoE metrics shall be reported, expressed as a floating-point value between 0.0 and 100.0. If not specified, reports shall be sent for all media delivery sessions.
<i>urlFilters</i>	array(string)	0..1	If present, a non-empty list of Media Entry Point URL patterns for which QoE metrics shall be reported. If not specified, reporting shall be done for all media delivery sessions initiated within the scope of the parent Provisioning Session.
<i>samplingPeriod</i>	DurationSec	1..1	The time interval the Media Client should wait between sampling the QoE metrics specified by this Metrics Reporting Configuration. The value shall be greater than zero.
<i>positiveCrossingThresholds</i>	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.

Property name	Type	Cardinality	Description
<i>negativeCrossingThresholds</i>	map(Uri -> array(Float))	0..1	If present, a non-empty map of QoE metrics and 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.
<i>locationFilter</i>	array(LocationArea5G)	0..1	A list of one or more locations (see NOTE 2) where QoE metrics collection is required. When present a Media Client shall collect the metrics only when it is located in these locations and shall report them according to the other properties of the enclosing resource. If omitted, QoE metrics are to be collected and reported regardless of the UE location.
<i>metrics</i>	array(Uri)	0..1	If present, a non-empty list of QoE metrics, each indicated using a fully-qualified term identifier from a controlled vocabulary, which shall be collected and reported by the Media Client. A controlled vocabulary of QoE metrics shall be specified by each QoE metrics scheme for use with this property. If omitted, the complete (or default, as applicable) set of metrics associated with the specified metrics scheme shall be collected and reported.
NOTE 1: The <i>Snssai</i> data type is specified in TS 29.571 [33].			
NOTE 2: The <i>LocationArea5G</i> data type is specified in TS 24.558 [14].			

8.12 Consumption Reporting provisioning API

8.12.1 Overview

The Consumption Reporting Provisioning API is a RESTful API that allows a Media Application Provider to configure the Consumption Reporting Procedure for a particular downlink media delivery Provisioning Session at reference point M1. The different interactions are described in clause 5.2.12. The Consumption Reporting Configuration is represented by a *ConsumptionReportingConfiguration* resource, the data model for which is specified in clause 8.12.3 below. The RESTful resources for managing the Consumption Reporting Configuration are specified in clause 8.12.2.

8.12.2 Resource structure

The Consumption Reporting Provisioning API is accessible through the following URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 8.12.2-1 below specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the Provisioning Session identifier shall be substituted into *{provisioningSessionId}* in the above URL template and the sub-resource path specified in the second column shall be appended to the URL base path.

Table 8.12.2-1: Operations supported by the Consumption Reporting Provisioning API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Create Consumption Reporting Configuration resource	consumption-reporting-configuration	POST	Activate the consumption reporting procedure for a Provisioning Session by providing the Consumption Reporting Configuration.
Retrieve Consumption Reporting Configuration resource		GET	Retrieve an existing Consumption Reporting Configuration.
Update Consumption Reporting Configuration resource		PUT, PATCH	Replace or modify an existing Consumption Reporting Configuration.
Destroy Consumption Reporting Configuration resource		DELETE	Deactivate the consumption reporting procedure for the parent Provisioning Session.

8.12.3 Data model

8.12.3.1 ConsumptionReportingConfiguration resource

Table 8.12.3.1-1: ConsumptionReportingConfiguration resource

Property name	Type	Cardinality	Description
<i>reportingInterval</i>	DurationSec	0..1	The interval between two consecutive consumption reports. The value shall be greater than zero. If absent, a single final report shall be sent immediately after the media streaming session has ended.
<i>samplePercentage</i>	Percentage	0..1	The proportion of media streaming clients that shall report media consumption, expressed as a floating-point value between 0.0 and 100.0. If not specified, all clients shall send consumption reports.
<i>accessReporting</i>	boolean	0..1	Stipulates whether the Media Session Handler is required to provide consumption reporting messages to the Media AF when the access network changes during a media streaming session. If omitted, access network change reporting is disabled.

8.13 Event Data Processing provisioning API

8.13.1 General

The Event Data Processing Provisioning API is used by a Media Application Provider to provide Event Data Processing Configurations to the Data Collection AF instantiated in the Media AF. Each such configuration is represented by an *EventDataProcessingConfiguration* resource, the data model of which is specified in clause 8.13.3 below. It comprises processing rules and parameters expressed using Data Access Profiles (specified in TS 26.532 [40]), each of which defines a level of access by Event consumers to the UE data collected by the Data Collection AF. The RESTful structure of the Data Exposure Restriction Configuration resource collection, along with the operations and corresponding HTTP methods for managing resources of this type are defined in clause 8.13.2.

8.13.2 Resource structure

The Event Data Processing Provisioning API is accessible through the following URL base path:

{apiRoot}/3gpp-maf-provisioning/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 8.13.2-1 below specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the Provisioning Session identifier shall be substituted into *{provisioningSessionId}* in the above URL template and the sub-resource path specified in the second column shall be appended to the URL base path.

Table 8.13.2-1: Operations supported by the Data Exposure Restriction API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Create Event Data Processing Configuration	event-data-processing-configurations	POST	Create a new Event Data Processing Configuration resource.
Retrieve Event Data Processing Configuration	event-data-processing-configurations/ <i>{eventDataProcessingConfigurationId}</i>	GET	Retrieve an existing Event Data Processing Configuration.
Update Event Data Processing Configuration		PUT, PATCH	Modify or replace an existing Event Data Processing Configuration.
Destroy Event Data Processing Configuration		DELETE	Destroy an existing Event Data Processing Configuration.

8.13.3 Data model

8.13.3.1 EventDataProcessingConfiguration resource type

Table 8.13.3-1: Definition of EventDataProcessingConfiguration resource

Property name	Type	Cardinality	Description
<i>eventDataProcessingConfigurationId</i>	ResourceId	1..1	An identifier for this Event Data Processing Configuration assigned by the Media AF that is unique within the scope of the enclosing Provisioning Session.
<i>eventId</i>	AfEvent	1..1	One of the enumerated values specified in clause 5.6.3.3 of TS 29.517 [39] relating to Media Delivery.
<i>authorizationUrl</i>	AbsoluteUrl	0..1	A URL that may be used to authorize the Event consumer entity to enable its subscription to the Data Collection AF for event notification, subject to the data access restrictions of a Data Access Profile.
<i>dataAccessProfiles</i>	array(Data AccessProfile)	1..1	One or more Data Access Profile definitions, each one describing a set of data processing instructions to be applied by the Data Collection AF when exposing events to an associated Event consumer entity. (See clause 6.3.3.2 of TS 26.532 [40].) The controlled vocabularies to be used with <i>DataAccessProfile.parameters</i> are not specified in the present document.

9 Maf_SessionHandling service

9.1 Overview

This clause defines the network media session handling API used by a Media AS at reference point M3 or by a Media Session Handler at reference point M5 to access Service Access Information and to invoke the session handling features provisioned using the APIs in clause 8. The corresponding OpenAPI definitions for the *Maf_SessionHandling* service are specified in clause A.4. A summary of the resource structure is shown in table 9.1-1 below. The default endpoint address of the Media AF at reference point M3 is specified in clause 7.1.2.2 and that at reference point M5 is specified in clause 7.1.2.3.

Table 9.1-1: Resource structure of Maf_SessionHandling APIs

HTTP request path element hierarchy	Description	Allowed HTTP methods					Resource structure definition clause	OpenAPI definition clause
		Create	Retrieve	Update	Destroy	Non-RESTful operation		
service-access-information	Service Access Information collection						9.2.2	A.4.1
<i>{externalServiceId}</i>	Service Access Information resource		GET					
provisioning-sessions	Provisioning Sessions collection							
<i>{provisioningSessionId}</i>	Provisioning Session path element							
dynamic-policies	Dynamic Policies collection	POST					9.3.2	A.4.2
<i>{dynamicPolicyId}</i>	Dynamic Policy resource		GET	PUT, PATCH	DELETE			
network-assistance-sessions	Network Assistance Sessions collection	POST					9.4.2	A.4.3
<i>{naSessionId}</i>	Network Assistance Session resource		GET	PUT, PATCH	DELETE			
recommendation	Bit rate recommendation request operation					GET		
boost	Delivery boost request operation					POST		
metrics-reporting	Metrics Reporting endpoint collection						9.5.2	A.4.4
<i>{metricsReportingConfigurationId}</i>	Metrics Reporting operation					POST		
consumption-reporting	Consumption Reporting endpoint					POST	9.6.2	A.4.5

9.2 Service Access Information API

9.2.1 General

The Service Access Information API is used by the Media Session Handler or Media AS to obtain configuration information from the Media AF that enables it to use the other Media Session Handling APIs specified in clause 9.3 *et seq.*

9.2.2 Resource structure

The Service Access Information API is accessible through the following URL base path:

{apiRoot}/3gpp-maf-session-handling/{apiVersion}/service-access-information/

The operations and the corresponding HTTP methods in table 9.2.2-1 are supported. In each case, the sub-resource path specified in the second column shall be appended to the URL base path.

Table 11.2.2-1: Operations supported by the Service Access Information API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Retrieve Service Access Information	<i>{externalServiceId}</i>	GET	Acquire the Service Access Information resource for the specified Provisioning Session.

9.2.3 Data model

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
<i>provisioningSessionId</i>		ResourceId	1..1	Unique identification of the M1 Provisioning Session.	All types
<i>provisioningSessionType</i>		ProvisioningSessionType	1..1	The type of Provisioning Session.	All types.
<i>locationReporting</i>		boolean	1..1	If <i>true</i> , 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 <i>false</i> if the <i>locationReporting</i> parameter is omitted from the <i>ProvisioningSession</i> , as specified in table 8.2.3.1-1.	All types.
<i>notificationURL</i>		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.
<i>streamingAccess</i>		object	0..1	Present if Content Hosting or Content Publishing is provisioned in the parent Provisioning Session.	<i>MS_DOWNLINK</i> , <i>MS_UPLINK</i>
	<i>entryPoints</i>	array(AbsoluteMediaEntry Point)	0..1	A list of alternative Media Entry Points for the Media Client to choose between.	
	<i>locator</i>	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, one of the following: - A pointer to a document available for download at reference point M4 that defines a media presentation (e.g. a DASH MPD) whose resources are mapped to reference point M2 or M10 by means of a content ingest configuration in a Content Hosting Configuration. - A pointer to a document available for download at reference point M4 that provides additional details for a downlink streaming session configuration and/or references a media presentation (e.g. a DASH MPD) whose resources are mapped to reference point M2 or M10 by means of content ingest configuration in a Content Hosting Configuration. - 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 or M10 by means of a content ingest configuration in a Content Hosting Configuration. In all the above cases, the <i>contentType</i> property shall also be present. For uplink media streaming, one of the following:	

Property name			Type	Cardinality	Description	Applicability
					- A pointer to a document available for download 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 or M10 by means of a content egest configuration in a Content Publishing Configuration (in which case the <i>contentType</i> property shall also be present) - A pointer to a document available for download at reference point M4 that provides additional details for an uplink streaming session configuration and/or references a media presentation (e.g. a DASH MPD) whose resources are mapped to reference point M2 or M10 by means of content egest configuration in a Content Publishing Configuration (in which case the <i>contentType</i> property shall also be present). - The URL of a path at reference point M4 the sub-resources of which are mapped to reference point M2 or M10 by a Content Publishing Configuration (in which case the <i>protocol</i> property shall also be present).	
		<i>contentType</i>	string	1..1	The MIME content type of resource at <i>locator</i> . This property shall be mutually exclusive with <i>protocol</i> .	
		<i>protocol</i>	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 <i>contentType</i> . The controlled vocabulary of media delivery protocols at this reference point is specified in clause 10 of TS 26.512 [6].	
		<i>profiles</i>	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.	
		<i>eMBMSService AnnouncementLocator</i>	AbsoluteUrl	0..1	A pointer to an eMBMS User Service Announcement document.	
		<i>mbsExternalService Identifier</i>	string	0..1	The external service identifier of an MBS User Service.	

Property name		Type	Cardinality	Description	Applicability
<i>rtcClientConfiguration</i>		object	0..1	Present if real-time media communication (RTC) is provisioned.	RTC
	<i>stunEndpoints</i>	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 <i>provisioningSessionId</i> . If the <i>credentials</i> 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.	
	<i>turnEndpoints</i>	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 <i>provisioningSessionId</i> . If the <i>credentials</i> 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.	
	<i>swapEndpoints</i>	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 <i>provisioningSessionId</i> . If the <i>credentials</i> 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.	
<i>clientConsumptionReportingConfiguration</i>		object	0..1	Present if consumption reporting is activated for this Provisioning Session.	MS_DOWNLINK, RTC
	<i>reportingInterval</i>	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.	
	<i>serverAddresses</i>	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 <i>{apiVersion}</i> path element.	
	<i>accessReporting</i>	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 <i>false</i> if the <i>accessReporting</i> parameter is omitted from the <i>ConsumptionReportingConfiguration</i> , as specified in table 8.12.3.1-1.	
	<i>samplePercentage</i>	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 <i>samplePercentage</i> parameter is omitted from the <i>ConsumptionReportingConfiguration</i> , as specified in table 8.12.3.1-1.	

Property name		Type	Cardinality	Description	Applicability
<i>dynamicPolicyInvocationConfiguration</i>		object	0..1	Present if Policy Templates have been provisioned in the parent Provisioning Session and at least one of them is in the <i>READY</i> state.	<i>MS_DOWNLINK</i> , <i>MS_UPLINK</i> , <i>RTC</i>
	<i>serverAddresses</i>	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 <i>{apiVersion}</i> path element.	
	<i>policyTemplateBindings</i>	array(object)	1..1	A list of duples, each one binding an external reference to a Policy Template resource identifier.	
	<i>externalReference</i>	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".	
	<i>policyTemplateId</i>	ResourceId	1..1	The resource identifier of a Policy Template tagged with <i>externalReference</i> that is in the <i>READY</i> state.	
	<i>pduSetMarking</i>	boolean	0..1	If <i>true</i> , indicates that PDU Set marking applies to Dynamic Policy Instances based on <i>policyTemplateId</i> . Default value <i>false</i> if omitted.	<i>RTC</i>
	<i>downlinkDataBurstSizeMarkingRequired</i>	boolean	0..1	If <i>true</i> , indicates that data burst size marking of downlink PDUs is required for Dynamic Policy Instances based on <i>policyTemplateId</i> . Default value <i>false</i> if omitted.	
	<i>downlinkTimeToNextBurstMarkingRequired</i>	boolean	0..1	If <i>true</i> , indicates that time to next burst marking of downlink PDUs is required for Dynamic Policy Instances based on <i>policyTemplateId</i> . Default value <i>false</i> if omitted.	
	<i>downlinkExpeditedTransferIndicationMarkingRequired</i>	boolean	0..1	If <i>true</i> , indicates that expedited transfer indication marking of downlink PDUs is required for Dynamic Policy Instances based on <i>policyTemplateId</i> . Default value <i>false</i> if omitted.	
	<i>bdtWindows</i>	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 <i>policyTemplateId</i> . The actual usage quotas for data volume and bit rate are determined by the Media AF upon instantiation of the Policy Template. <i>BdtWindow</i> is specified in clause 7.3.3.14.	<i>MS_DOWNLINK</i> , <i>MS_UPLINK</i>
	<i>l4sEnablementPreference</i>	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. Present only if ECN marking for L4S functionality is supported in the 5G System and by the Media AS. The Media AF may query the features supported by the 5G System (i.e. PCF, NEF) as described in clause 6.6.2 of TS 29.500 [30]. Default value <i>false</i> if omitted.	<i>MS_DOWNLINK</i> , <i>MS_UPLINK</i> , <i>RTC</i>
	<i>qoSMonitoringEnablementPreference</i>	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.	

Property name			Type	Cardinality	Description	Applicability
					Present only if the QoS monitoring feature is supported in the 5G System. The Media AF may query the features supported by the 5G System (i.e. PCF, NEF) as described in clause 6.6.2 of TS 29.500 [30]. Default value <i>false</i> if omitted.	
	<i>sdfMethods</i>		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.	
<i>clientMetricsReportingConfigurations</i>			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
	<i>metricsReportingConfigurationId</i>		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).	
	<i>serverAddresses</i>		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 <i>{apiVersion}</i> path element.	
	<i>sliceScope</i>		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.	
	<i>scheme</i>		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].	
	<i>dataNetworkName</i>		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.	
	<i>reportingStartOffset</i>		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.	
	<i>reportingDuration</i>		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.	
	<i>reportingInterval</i>		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.	

Property name	Type	Cardinality	Description	Applicability
<i>samplePercentage</i>	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.	
<i>positiveCrossingThresholds</i>	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.	
<i>negativeCrossingThresholds</i>	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.	
<i>locationFilter</i>	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.	
<i>urlFilters</i>	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.	
<i>samplingPeriod</i>	DurationSec	1..1	The time interval the Media Client is required to wait between sampling the QoE metrics specified by this metrics reporting configuration.	
<i>metrics</i>	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 <i>scheme</i> shall be collected and reported.	
<i>networkAssistanceConfiguration</i>	object	0..1	Present if Network Assistance is provisioned in the parent Provisioning Session.	MS_DOWNLINK, MS_UPLINK, RTC
<i>serverAddresses</i>	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 <i>{apiVersion}</i> path element.	

Property name		Type	Cardinality	Description	Applicability
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].					

9.2.3.2 ClientServiceEndpointAccessParameters

This data type is derived by extension from *EndpointAddress* (see clause 7.3.3.11).

Table 9.2.3.2-1: Definition of ClientServiceEndpointAccessParameters data type

Property name	Data Type	Cardinality	Description
<i>domainName</i>	string	1..1	The Fully-Qualified Domain Name of this service endpoint.
<i>portNumbers</i>	array(UInt16)	1..1	A list of listening ports over which the service is accessible (e.g. a STUN service offers two listening ports). The array shall contain at least one member.
<i>credentials</i>	object	0..1	Authentication information to be presented to this service endpoint.
<i>username</i>	string	1..1	A username that is authorised to access the service.
<i>passphrase</i>	string	1..1	The passphrase associated with <i>username</i> .

9.2.3.3 EASDiscoveryTemplate type

Table 9.2.3.3-1: Definition of EASDiscoveryTemplate type

Property name	Type	Cardinality	Description
<i>easId</i>	string	0..1	The application identifier of the EAS, e.g. reverse FQDN, URI. If omitted, any Media EAS instance matching the other criteria specified in the template are acceptable. Corresponding to <i>EasCharacteristics.easId</i> , as specified in clause 6.3.5.2.7 of TS 24.558 [14].
<i>easType</i>	string	0..1	If present, a non-empty string indicating the type of Media EAS required to support media delivery sessions in the scope of this discovery template. Corresponding to <i>EasCharacteristics.easType</i> , as specified in clause 6.3.5.2.7 of TS 24.558 [14].
<i>easProviderIds</i>	array(string)	0..1	The non-empty set of acceptable Media EAS provider identifiers, each expressed as a non-empty string. If omitted, Media EAS instances of the specified <i>easType</i> from any provider are acceptable. Corresponding to <i>EasCharacteristics.easProvId</i> , as specified in clause 6.3.5.2.7 of TS 24.558 [14].
<i>easFeatures</i>	array(string)	0..1	The non-empty set of required service features for the Media EAS to serve media delivery sessions, each expressed as a non-empty string. If omitted, Media EAS instances of the specified <i>easType</i> with any feature set are acceptable. Corresponding to <i>EasCharacteristics.svcFeats</i> , as specified in clause 6.3.5.2.7 of TS 24.558 [14].

At least one of the properties shall be populated.

9.2.3.4 ClientEASRelocationRequirements type

Table 9.2.3.4-1: Definition of ClientEASRelocationRequirements type

Property name	Type	Cardinality	Description
<i>tolerance</i>	EASRelocationTolerance	1..1	Indicates whether the Media EAS instance tolerates relocation. (See clause 7.3.4.4.)
<i>maxInterruptionDuration</i>	UIntegerRm	0..1	The maximum downtime (expressed in milliseconds) that an application can tolerate during EAS relocation. If the expected downtime of the application is expected to exceed this duration, relocation of the Media EAS instance shall not be performed.

9.3 Dynamic Policy API

9.3.1 Overview

The Dynamic Policy API allows the Media Session Handler or Media AS to request a specific policy and charging treatment to be applied to a particular application data flow of a downlink or uplink media delivery session by invoking RESTful operations on the Media AF at reference point M5. The API defines a set of data models, resources and the related operations for the creation and management of the dynamic policy request.

9.3.2 Resource structure

The Dynamic Policy API is accessible through the following URL base path:

`{apiRoot}/3gpp-maf-session-handling/{apiVersion}/provisioning-sessions/{provisioningSessionId}/dynamic-policies/`

where the first three path elements shall be substituted by the Dynamic Policy invoker with one of the URLs selected from the *dynamicPolicyInvocation Configuration.serverAddresses* array of the *ServiceAccessInformation* resource (see clause 9.2.3.1) and the fifth path element shall be substituted with the value of the relevant Provisioning Session identifier obtained from the same resource.

Table 9.3.2-1 below specifies the operations and the corresponding HTTP methods that are supported by this API. The sub-resource path specified in the second column shall be appended to the URL base path.

Table 9.3.2-1: Operations supported by the Dynamic Policies API

Operation name	Sub-resource path	Allowed HTTP methods	Description
Create Dynamic Policy resource		POST	Create a new Dynamic Policy resource.
Retrieve Dynamic Policy resource	{dynamicPolicyId}	GET	Retrieve an existing Dynamic Policy resource.
Update Dynamic Policy resource		PUT	Replace an existing Dynamic Policy resource.
		PATCH	Modify an existing Dynamic Policy resource.
Destroy Dynamic Policy resource		DELETE	Remove an existing Dynamic Policy resource.

9.3.3 Data model

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
<i>dynamicPolicyId</i>	ResourceId	1..1	RO	Unique identifier for this Dynamic Policy Instance assigned by the Media AF when the resource is created.
<i>provisioningSessionId</i>	ResourceId	1..1	C: RO R: RO U: RO	Uniquely identifies the parent Provisioning Session, which is linked to the Application Service Provider.
<i>sessionId</i>	MediaDelivery SessionId	1..1	C: RW R: RO U: RO	Unique identifier of the current media delivery session.
<i>policyTemplateId</i>	ResourceId	1..1	C: RW R: RO U: RW	Identifies the Policy Template to be applied to the application flow(s) that fall within the scope of this Dynamic Policy Instance.
<i>sliceInfo</i>	Snsai	0..1	C: RW R: RO U: RW	Identifying the target slice in which the Policy Template is instantiated.
<i>dataNetworkName</i>	Dnn	0..1	C: RW R: RO U: RW	The name of the target Data Network in which the Policy Template is instantiated.
<i>location</i>	TypedLocation	0..1	C: RW R: RO U: RW	The location of the UE when the Dynamic Policy was created or last updated.

<i>applicationFlowBindings</i>	array(ApplicationFlowBinding)	1..1	C: RW R: RO U: 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.
<i>componentReference</i>	string	1..1	C: RW R: RO U: RW	References a particular service component in the Policy Template.
<i>applicationFlowDescription</i>	ApplicationFlowDescription	1..1	C: RW R: RO U: 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 and/or dynamically changing traffic characteristics are required by the Policy Template identified by <i>policyTemplateId</i> , this property shall also specify the media transport protocol parameters to be used by the Media Access Function for PDU Set and/or dynamically changing traffic characteristics signalling purposes. When media flow multiplexing is in use on the described application flow, this property shall also specify the media identification information parameters to be used by the Media Access Function for multiplexed media identification signalling purposes.
<i>qosSpecification</i>	ClientPolicySpecification	0..1	C: RW R: RO U: RW	The Dynamic Policy invoker's network policy requirements of the application flow described by <i>applicationFlowDescription</i> . If omitted, the default provisioned network policy constraints of the Policy Template indicated in <i>policyTemplateId</i> and the component indicated by <i>componentReference</i> shall apply to <i>applicationFlowDescription</i> .
<i>bdtSpecification</i>	ClientBdtSpecification	0..1	C: RW R: RO U: RW	The Background Data Transfer time windows and traffic limits that apply to this Dynamic Policy (see clause 9.3.3.3).
<i>qosEnforcement</i>	boolean	1..1	C: RO R: RO U: RO	Indication that the network policy described in <i>qosSpecification</i> is being enforced by the 5G System. Populated by the Media AF.
<i>l4SEnabled</i>	boolean	1..1	C: RO R: RO U: RO	Indication that ECN marking for L4S functionality is enabled in the 5G System. Populated by the Media AF.
<i>qoSMonitoringEnabled</i>	boolean	1..1	C: RO R: RO U: RO	Indication that QoS monitoring is enabled in the 5G System. Populated by the Media AF.
<i>qoSMonitoringResults</i>	QosMonitoringReport	0..1	C: RO R: RO U: RO	The most recent QoS monitoring results provided by the 5G System. Present only if this feature is currently enabled (as indicated by the <i>qoSMonitoringEnabled</i> property above). Populated by the Media AF.
NOTE: Data type <i>QosMonitoringReport</i> is defined in TS 29.122 [20].				

9.3.3.2 ApplicationFlowBinding

Table 9.3.3.2-1: ApplicationFlowBinding type

Property name	Data type	Cardinality	Description
<i>componentReference</i>	string	1..1	References a particular service component in the Policy Template.
<i>applicationFlowDescription</i>	ApplicationFlowDescription	1..1	The specification of an application flow to be used by the 5G Core for application traffic identification purposes (see clause 7.3.3.2).
<i>qosSpecification</i>	ClientPolicySpecification	0..1	The network policy requirements of the application flow(s) described by <i>applicationFlowDescription</i> .

9.3.3.3 ClientBdtSpecification type

Table 9.3.3.3-1: ClientBdtSpecification type

Property name	Type	Cardinality	Description
<i>estimatedDataTransferVolume</i>	UsageThreshold	0..1	The data volume that the Media Client expects to transfer in both directions at reference point M4 during the current time window (see NOTE). Value provided by the Media Session Handler to the Media AF.
<i>windows</i>	array(BdtWindow)	1..1	Windows when Background Data Transfers are requested by the Media Session Handler or granted by the Media AF. The array shall contain at least one window specification.
NOTE: Data type <i>UsageThreshold</i> is defined in TS 29.122 [20].			

9.4 Network Assistance API

9.4.1 Overview

If AF-based Network Assistance is supported by the Media AF, then the Network Assistance API, as defined in the following clauses, is first used to provision a Network Assistance Session resource at reference point M5. The Network Assistance resource can then be used to obtain bit rate recommendations and to issue delivery boost requests during the ongoing media delivery session.

9.4.2 Resource structure

The Network Assistance API is accessible via the following URL base path:

{apiRoot}/3gpp-maf-session-handling/{apiVersion}/provisioning-sessions/{provisioningSessionId}/network-assistance-sessions/

where the first three path elements shall be substituted by the Network Assistance invoker with one of the URLs selected from the *networkAssistanceConfiguration.serverAddresses* array of the *ServiceAccessInformation* resource (see clause 9.2.3.1) and the fifth path element shall be substituted with the relevant Provisioning Session identifier obtained from the same resource.

Table 9.4.2-1 below specifies the operations and the corresponding HTTP methods that are supported by this API. In each case, the sub-resource path specified in the second column of the table shall be appended to the URL base path.

Table 9.4.2-1: Operations supported by the Network Assistance API

Operation name	Sub-resource path	Allowed HTTP method(s)	Description
Create Network Assistance Session resource		POST	Provision a new Network Assistance Session. If the operation succeeds, the URL of the created Network Assistance Session resource shall be returned in the Location header of the response.
Retrieve Network Assistance Session resource	<i>{naSessionId}</i>	GET	Fetch the properties of an existing Network Assistance Session.
Bit rate recommendation request	<i>{naSessionId}/recommendation</i>	GET	Obtain a bit rate recommendation.
Delivery boost request	<i>{naSessionId}/boost-request</i>	POST	Request a delivery boost.
Update Network Assistance Session resource	<i>{naSessionId}</i>	PUT, PATCH	Update the properties of an existing Network Assistance Session.
Destroy Network Assistance Session	<i>{naSessionId}</i>	DELETE	Terminate a Network Assistance session.

9.4.3 Data model

9.4.3.1 NetworkAssistanceSession resource

Table 9.4.3.1-1: Definition of NetworkAssistanceSession resource

Property name	Type	Cardinality	Usage	Description
<i>naSessionId</i>	ResourceId	1..1	C: RO R: RO U: RO	Unique identifier for this Network Assistance Session assigned by the Media AF when the resource is created.
<i>provisioningSessionId</i>	ResourceId	1..1	C: RO R: RO U: RO	Uniquely identifies the parent Provisioning Session, which is linked to the Application Service Provider.
<i>sessionId</i>	MediaDelivery SessionId	1..1	C: RW R: RO U: RO	Unique identifier of the current media delivery session.
<i>sliceInfo</i>	Snssai	0..1	C: RW R: RO U: RW	Identifying the target network slice in which Network Assistance is sought.
<i>dataNetworkName</i>	Dnn	0..1	C: RW R: RO U: RW	The name of the target Data Network in which Network Assistance is sought.
<i>location</i>	TypedLocation	0..1	C: RW R: RO U: RW	The location of the UE when the Network Assistance Session was created or last updated.
<i>policyTemplateId</i>	ResourceId	0..1	C: RW R: RO U: RW	Identification of the policy (if any) that is currently in force for the media delivery session.
<i>componentReference</i>	string	0..1	C: RW R: RO U: RW	References a particular service component in the Policy Template. This property shall be present if <i>policyTemplate</i> is present.
<i>applicationFlowDescription</i>	ApplicationFlow Description	1..1	C: RW R: RO U: RW	Identifying the application flow for which Network Assistance is sought, e.g. 2-tuple (IP address pair) or 5-tuple (IP address pair, port pair and protocol).
<i>requestedQoS</i>	ClientPolicy Specification	0..1	C: RW R: RO U: RW	The network policy requested by the Network Assistance invoker.
<i>recommendedQoS</i>	ClientPolicy Specification	0..1	C: RO R: RO U: RO	The network policy currently recommended by the Media AF.

9.5 Metrics Reporting API

9.5.1 General

The Metrics Reporting API allows the Media Session Handler or Media AS (acting in the role of metrics reporting entity) to send QoE metrics reports to the Media AF. This procedure is configured by the *ServiceAccessInformation* resource, as defined in clause 9.2.3.1. Multiple metrics reporting configurations may be active at the same time, each identified by a unique *metricsReportingConfigurationId*.

9.5.2 Reporting procedure

Metrics reports related to a specific *metricsReportingConfigurationId* shall be submitted according to the following general format:

`{apiRoot}/3gpp-maf-session-handling/{apiVersion}/provisioning-sessions/{provisioningSessionId}/metrics-reporting/{metricsReportingConfigurationId}`

where the first three path elements shall be substituted by the metrics reporting entity with one of the base URLs selected from the *clientMetricsReportingConfigurations*. *serverAddresses* array of the *ServiceAccessInformation* resource (see clause 9.2.3.1), the fifth path element shall be substituted with the relevant Provisioning Session identifier obtained from the same resource and *{metricsReportingConfigurationId}* shall be substituted with the relevant Metrics Reporting Configuration identifier.

The only HTTP method supported by this endpoint is POST.

9.5.3 Report format

9.5.3.1 General

Metrics reports shall be submitted by the metrics reporting entity in a format specified by the metrics scheme in question. The **Content-Type** HTTP request header shall be set in accordance with the specification of the relevant metrics scheme.

Metrics schemes specified by 3GPP shall make provision to convey the media delivery session identifier in their metrics reports. For metrics reporting formats specified elsewhere, the 3GPP specification referencing the metrics scheme should specify a means to convey the media delivery session identifier in metrics reports where practicable.

9.5.3.2 JSON-based metrics reporting envelope

A JSON-based reporting envelope is specified in table 9.5.3.2-1 below. The OpenAPI YAML syntax of the *MetricsReport* data type and its subordinate data types is specified in clause A.4.4. QoE metrics reports following the syntax of this reporting envelope shall be identified with the MIME media type *application/3gpp-media-delivery-metrics-report+json* as registered in clause E.2.

- The *version* parameter of the MIME media type shall be set to the value "Rel19" to indicate compliance with this version of the present document.

Table 9.5.3.2-1: Definition of MetricsReport data type

Property name	Type	Cardinality	Description
<i>reportTimestamp</i>	DateTime	1..1	Date–time (see NOTE) at which this metrics report was compiled by the metrics reporting entity.
<i>sessions</i>	array(MetricsSession)	1..1	An array whose members (see table 9.5.3.2-2) convey metrics for one media delivery session each. An empty array indicates that there are no active media delivery sessions to report.
NOTE: Data type <i>DateTime</i> is specified in TS 29.571 [33].			

The *MetricsSession* data type describes a set of metrics samples pertaining to a single active media delivery session.

Table 9.5.3.2-2: Definition of MetricsSession data type

Property name	Type	Cardinality	Description
<i>clientId</i>	string	1..1	Reporting client identifier, as specified in clause 5.3.5.2.
<i>provisioningSessionId</i>	ResourceId	1..1	Uniquely identifies the parent Provisioning Session, which is linked to the Application Service Provider.
<i>sessionId</i>	MediaDeliverySessionId	1..1	Unique identifier of the current media delivery session.
<i>contentId</i>	string	0..1	Identifying the content currently being consumed in the media delivery session, if known. Populated from the <i>createMediaDeliverySession()</i> method (see clause 11.2.2.1-1) or from a query parameter of the 3GPP Service URL (see clause 6).
<i>samples</i>	array(MetricsSample)	1..1	An array whose members (see table 9.5.3.2-3) convey metrics for this media delivery session. An empty array indicates that there are currently no samples to report for this media delivery session.

The *MetricsSample* data type describes a set of metrics sampled at a particular point in time. This data type is intended to be extended by other specifications.

Table 9.5.3.2-3: Definition of MetricsSample data type

Property name	Type	Cardinality	Description
<i>sampleTimestamp</i>	DateTime	1..1	Date–time (see NOTE 1) at which the set of metrics was sampled.
<i>sliceInfo</i>	Snssai	0..1	Identifying the network slice in which the set of metrics were sampled, if applicable
<i>dataNetworkName</i>	Dnn	0..1	The name of the Data Network in which the set of metrics were sampled, if applicable.
<i>mediaStreamingClientData</i>	MediaStreamingClientData	0..1	Client data for 5G Media Streaming (see NOTE 2 and below).
NOTE 1: Data type <i>DateTime</i> is specified in TS 29.571 [33].			
NOTE 2: Data type <i>MediaStreamingClientData</i> is specified in clause 11.4.3.3 of TS 26.512 [6].			

At least one of the following properties shall be present in a *MetricsSample* object: *mediaStreamingClientData*.

9.6 Consumption Reporting API

9.6.1 General

The Consumption Reporting API allows the Media Session Handler or Media AS (acting in the role of consumption reporting entity) to report downlink media consumption to the Media AF. The API defines data models, resources and the related operations for the creation and management of the consumption reporting procedures. This feature is configured by the *ServiceAccessInformation* resource, as defined in clause 9.2.3.1.

9.6.2 Reporting procedure

Consumption reports shall be submitted to a Media AF endpoint according to the following general URL format:

{apiRoot}/3gpp-maf-session-handling/{apiVersion}/provisioning-sessions/{provisioningSessionId}/consumption-reporting/

Where the first three path elements shall be substituted by the consumption reporting entity with one of the base URLs selected from the *clientConsumptionReportingConfiguration.serverAddresses* array of the *ServiceAccessInformation* resource (see clause 9.2.3.1) and the fifth path element shall be substituted with the relevant Provisioning Session identifier obtained from the same resource.

The only HTTP method supported by this endpoint is POST.

9.6.3 Report format

9.6.3.1 ConsumptionReport type

This data type specifies the root object of a consumption report instance document used by the Media Session Handler to report media consumption.

Table 9.6.3.1-1: Definition of ConsumptionReport format

Property name	Data type	Cardinality	Description
<i>reportingClientId</i>	string	1..1	Identifier of the consumption reporting entity that consumed the streaming media service associated with this consumption report. If available to the Media Session Handler, a GPSI value (see clause 28.8 of TS 23.003 [16]); otherwise, a stable and globally unique string.
<i>sessionId</i>	MediaDelivery SessionId	1..1	Unique identifier of the reported media delivery session.
<i>mediaPlayerEntry</i>	AbsoluteUrl	1..1	Media Entry Point resource locator of the reported media delivery session. The content of this property is not specified in the present document.
<i>consumptionReportingUnits</i>	array(Consumption ReportingUnit)	1..1	A list of consumption reporting units, ordered by start time. The content of this property is not specified in the present document.

9.6.3.2 ConsumptionReportingUnit type

This data type represents a single consumption reporting unit.

Table 9.6.3.2-1: Definition of type ConsumptionReportingUnit

Property name	Data type	Cardinality	Description
<i>mediaConsumed</i>	string	1..1	Identifies the media consumed. Populated from the current content identifier, if set in the Media Session Handler (see table 11.2.3-1 and clause 11.2.2.1) and/or additional identifiers specified outside the present document.
<i>clientEndpointAddress</i>	EndpointAddress	0..1	The IP address and port number of the Media Access Function endpoint used to access the media consumed (see clause 7.3.3.11). Present only if access reporting is enabled in the Consumption Reporting Configuration.
<i>serverEndpointAddress</i>	EndpointAddress	0..1	The IP address, port number and host name of the Media AS endpoint used to access the media consumed (see clause 7.3.3.11). Present only if access reporting is enabled in the Consumption Reporting Configuration.
<i>startTime</i>	DateTime	1..1	The time when this consumption reporting unit started.
<i>duration</i>	DurationSec	1..1	The duration of this consumption reporting unit relative to <i>startTime</i> . The value shall not be negative. Media consumed for less than 1 second should be reported with <i>duration</i> = 0. For consumption reporting units describing the currently consumed media, this shall indicate the duration so far.
<i>sliceInfo</i>	Snssai	0..1	Identifying the network slice in which the media was consumed.
<i>dataNetworkName</i>	Dnn	0..1	The name of the Data Network in which the media was consumed.
<i>locations</i>	array(TypedLocation)	0..1	A time-ordered list of one or more UE location(s) where the media was consumed during the period of this consumption reporting unit (see clause 7.3.3.8). Present only if location reporting is enabled in the Consumption Reporting Configuration (only for trusted Media AF).

10 Ancillary network media session handling services

10.1 Overview

This clause specifies ancillary network media session handling services used by a Media AS at reference point M3 or by a Media Session Handler at reference point M5 to interact with the Media AF.

10.2 Resource update notification channel

10.2.1 General

The Media Session Handler and the Media AF shall support the usage of an MQTT notification channel that is used by the Media AF to notify the Media Session Handler about updates to certain resources specified in clause 9. For this purpose, the MQTT protocol [50] shall be used over TLS as specified below.

The Media AF shall use a trusted MQTT broker for the exchange of these notifications. The MQTT broker shall use appropriate client authentication mechanisms, such as a token-based authentication mechanism (JWT) [51] to secure access to the notification channel.

The MQTT Topics shall be structured as defined in clause 10.2.2.

The MQTT Messages shall be formatted according to clause 10.2.3.

10.2.2 Topic structure of notification channel

The MQTT Topics on the resource update notification channel shall be formatted according to the following ABNF syntax:

Topic = *externalServiceId* ["/" *resourceId*]

Where:

- *externalServiceId* is the external service identifier that is associated with a Provisioning Session.
- The *resourceId* if present, identifies a sub-topic associated with a resource previously created at reference point M5 by a particular Media Session Handler and having *resourceId* as its resource identifier.

The Media Session Handler shall at least subscribe to the *{externalServiceId}* topic, enabling the reception of all common notification messages relating to a particular Provisioning Session. Service Access Information update notification messages shall be published to the common topic. Dynamic Policy Instance and Network Assistance Session update notification messages shall be published to the sub-topics using their respective *resourceId* values, and are specific to a particular media delivery session.

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
<i>type</i>	<i>NotificationMessageType</i>	1..1	The type of resource carried by this notification message (see table 10.2.3-2).
<i>reason</i>	<i>NotificationReason</i>	1..1	The reason for the notification (see table 10.2.3-3).
<i>entityTag</i>	<i>string</i>	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.
<i>lastModified</i>	<i>DateTime</i>	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.
<i>serviceAccessInformation</i>	<i>ServiceAccessInformation</i>	0..1	Present if <i>type</i> is <i>NOTIFICATION_SERVICE_ACCESS_INFORMATION</i> .
<i>dynamicPolicy</i>	<i>DynamicPolicy</i>	0..1	Present if <i>type</i> is <i>NOTIFICATION_DYNAMIC_POLICY_INSTANCE</i> .
<i>networkAssistanceSession</i>	<i>NetworkAssistanceSession</i>	0..1	Present if <i>type</i> is <i>NOTIFICATION_NETWORK_ASSISTANCE_SESSION</i> .

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
<i>NOTIFICATION_SERVICE_ACCESS_INFORMATION</i>	Notification of a change to a Service Access Information resource.
<i>NOTIFICATION_DYNAMIC_POLICY_INSTANCE</i>	Notification of a change to a Dynamic Policy Instance resource.
<i>NOTIFICATION_NETWORK_ASSISTANCE_SESSION</i>	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
Enumeration value	Description
<i>NOTIFICATION_REASON_PROVISIONING_UPDATE</i>	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).
<i>NOTIFICATION_REASON_BACKGROUND_DATA_TRANSFER_WINDOW_CANCELLATION</i>	The notification is being sent because a Background Data Transfer window has been cancelled by the Media AF.
<i>NOTIFICATION_REASON_QOS_MONITORING_RESULTS</i>	The notification is being sent because the Media AF has received QoS monitoring results from the 5G Core.

11 UE media session handling APIs

11.1 Introduction

This clause defines the abstract client APIs exposed by the Media Session Handler to the Media-aware Application at reference point M6 and to the Media Access Function at reference point M11. The APIs may be used to query a subset of information from Service Access Information and its updates as well as to control the life-cycle of a media delivery session and to receive notifications of various events occurring during that media delivery session.

NOTE: Client-driven management of edge processing resources via reference point EDGE-5 is not specified in this release.

11.2 Media Session Handler client API

11.2.1 Media Session Handler internal properties

The Media Session Handler maintains internal properties as defined table 11.2.1-1. Note that the parameters are conceptual and internal. They serve only for the purpose of defining the media session handling APIs.

Table 11.2.1-1: Parameters of Media Session Handler internal data model

States and Parameters	Definition
<i>_Configuration[externalServiceId]</i>	The Media Session Handler maintains a separate configuration for each set of Service Access Information it has knowledge of, indexed by its external service identifier.
<i>_streamingAccess</i>	Streaming access configuration.
<i>_rtcClient</i>	RTC Client configuration.
<i>_networkAssistance</i>	Network Assistance configuration.
<i>_policyTemplate</i>	Policy Template configuration.
<i>_consumptionReporting</i>	Consumption reporting configuration.
<i>_metricsReporting</i>	Metrics reporting configurations.
<i>_edgeResources</i>	Edge resources configuration.
<i>_status[mediaDeliverySessionId]</i>	The Media Session Handler maintains a separate status record for each currently active media delivery session, indexed by media delivery session identifier.
<i>_generalStatus</i>	General status information. (See table 11.2.3-1.)
<i>_dynamicPolicyStatus</i>	Dynamic Policy status information. (See table 11.3.2-1)
<i>_networkAssistanceStatus</i>	Network Assistance status information. (See table 11.4.2-1)
<i>_consumptionReportingStatus</i>	Consumption Reporting status information. (See table 11.5.2-1.)
<i>_metricsReportingStatus</i>	Metrics Reporting status information. (See table 11.6.2-1.)

A subset of the above information which is needed by the 5GMS-Aware Application and/or by the Media Access Function is accessible through reference points M6 and M11, respectively, using the methods specified in the following clauses.

11.2.2 General Media Session Handler methods

11.2.2.1 Create a media delivery session

A 3GPP Service URL (see clause 6) may be used to implicitly trigger the creation of a new media delivery session with the Media Session Handler.

The Media Session Handler also offers the explicit *createMediaDeliverySession()* method, which is used to create a new media delivery session in the Media Session Handler.

The input parameters of the method are specified in table 11.2.2.1-1:

Table 11.2.2.1-1: Input parameters for createMediaDeliverySession() method

Name	Type	O	Description
<i>serviceId</i>	string	M	The external service identifier (see table 8.2.3.1-1) of the Provisioning Session that this media delivery session pertains to.
<i>contentId</i>	string	O	A content identifier for the media to be consumed in this media delivery session.
<i>entryPoint</i>	url	O	The location of a Media Entry Point document or media resource.
<i>domainNames</i>	array(string)	O	A set of Fully-Qualified Domain Name (FQDN) of the Media AS endpoint(s) supporting the media delivery session at reference point M4.
<i>accessToken</i>	string	O	An access token that the Media Session Handler presents to the Media AF to authorise invocation of media session handling operations at reference point M5.

If it does not already have a fresh copy cached, the Media Session Handler shall attempt to retrieve a copy of the full Service Access Information from the Media AF at reference point M5 using the procedure specified in clause 5.3.2.

If successful, the Media Session Handler shall assign a new media delivery session identifier to the media delivery session and shall create an entry in its *_status* array indexed by the media delivery session identifier.

If the *entryPoint* input parameter is provided, the Media Session Handler shall attempt to initialise the Media Access Function using an appropriate method, and shall pass the Media Entry Point URL to it (as well as the media delivery session identifier) in order to initiate media access.

If the *entryPoint* input parameter is provided, and indicates a Service Operation Point, the Media Session Handler shall create a Dynamic Policy Instance using the procedure specified in clause 5.3.3 using the Service Operation Point reference as the external reference. The Dynamic Policy Instance shall include a Policy Template binding for each of the domain names listed in the *domainNames* input parameter, if present.

If all of the above actions are successful, the Media Session Handler shall set *sessionHandlingState* to *ACTIVE* (see table 11.2.3-1) and shall send a *SESSION_HANDLING_ACTIVATED* notification (see table 11.2.3-2). If any of the above actions fail, the Media Session Handler shall set *sessionHandlingState* to *ERRORED* (see table 11.2.3-1).

The return value of the method is specified in table 11.2.2.1-2.

Table 11.2.2.1-2: Return value for createMediaDeliverySession() method

Type	Description
string	The media delivery session identifier.

11.2.2.2 Destroy a media delivery session

The *destroyMediaDeliverySession()* method is used to end the media delivery session and release the allocated resources by the Media Session Handler. As a result, the Media Session Handler does no longer maintains the internal properties corresponding to the media delivery session identifier.

The input parameters of the method are specified in table 11.2.2.2-1.

Table 11.2.2.2-1: Input parameters for destroyMediaDeliverySession() method

Name	Type	Description
<i>mediaDeliverySessionIdentifier</i>	string	The media delivery session identifier.

The Media Session Handler shall remove the entry from its *_status* array indexed by the media delivery session identifier.

The Media Session Handler shall send a *SESSION_HANDLING_TERMINATED* notification (see table 10.2.3-2).

11.2.3 General Media Session Handler information

Table 11.2.3-1 specifies the status information that can be obtained from the Media Session Handler for a particular media delivery session it is managing.

Table 11.2.3-1: General Media Session Handler Status Information

Status	Type	Definition
<i>contentIdentifier</i>	string	The content identifier currently associated with this media delivery session.
<i>sessionHandlingState</i>	string enum	The status of this media delivery session: <i>ACTIVE</i> : The media delivery session is being handled by the Media Session Handler. <i>ERRORED</i> : An error has occurred, and the Media Session Handler is no longer able to handle it.

Table 11.2.3-2 provides a list of general notification events exposed by the Media Session Handler through reference points M6 and M11.

Table 11.2.3-2: General Media Session Handler Notification Events

Event	Definition	Payload
<i>SESSION_HANDLING_ACTIVATED</i>	Triggered when media session handling was activated for a specific Media Entry Point.	Media delivery session identifier, Media Entry Point URL.
<i>SESSION_HANDLING_TERMINATED</i>	Triggered when media session handling is terminated for a specific Media Entry Point.	Media delivery session identifier, Media Entry Point URL.
<i>STREAMING_ACCESS_UPDATED</i>	Triggered when an update to the stream access is available for the Provisioning Session associated with the external service identifier supplied when the media delivery session was created (see clause 10.2.2.1).	Media delivery session identifier, Streaming access.
<i>RTC_CLIENT_CONFIGURATION_UPDATED</i>	Triggered when an update to the RTC Client configuration is available for the Provisioning Session associated with the external service identifier supplied when the media delivery session was created (see clause 10.2.2.1).	Media delivery session identifier, RTC Client configuration.

Table 11.3.3-3 provides a list of general error events exposed by the Media Session Handler through reference points M6 and M11.

Table 11.2.3-3: General Media Session Handler Error Events

Status	Definition	Payload
<i>ERROR_SESSION_HANDLING</i>	Triggered when there is an error in the media session handling.	Media delivery session identifier.

11.3 Dynamic Policy client API

11.3.1 Dynamic Policy methods

11.3.1.1 Retrieve Background Data Transfer information

The *getBDTInfo()* method is invoked to retrieve information about the next Background Data Transfer opportunity window at one of the Service Operation Points that are available in the context of a particular media delivery session.

The input parameters of the method are specified in tables 11.3.1.1-1.

Table 11.3.1.1-1: Input parameters for getBDTInfo() method

Name	Type	O	Description
<i>sessionId</i>	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.
<i>serviceOperationPointReference</i>	string	M	The external reference identifier of a Service Operation Point that uniquely identifies a Policy Template within the context of <i>sessionId</i> .

The anonymous return value of the method is specified in table 11.3.1.2-1.

Table 11.3.1.2-1: Return value for getBDTInfo() method

Name	Type	O	Description
—	object	C	Information about a Background Data Transfer opportunity. Null if the method invocation is unsuccessful.
<i>windowStart</i>	DateTime	M	The start date–time of the Background Data Transfer window.
<i>windowEnd</i>	DateTime	M	The end date–time of the Background Data Transfer window.
<i>maximumDataTransferVolume</i>	integer	M	The maximum volume of data (expressed in bytes) that a Media Access Function is permitted to transfer during the Background Data Transfer window.

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
<i>sessionId</i>	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.
<i>serviceOperationPointReference</i>	string	M	The external reference identifier of a Service Operation Point that uniquely identifies a Policy Template within the context of <i>sessionId</i> .
<i>estimatedTransferVolume</i>	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.
<i>recommendedDownlinkBitRate</i>	BitRate	M	The recommended downlink bit rate for the requested Service Operation Point.
<i>recommendedUplinkBitRate</i>	BitRate	M	The recommended uplink bit rate for the requested Service Operation Point.
<i>grantedBackgroundDataTransferWindows</i>	array(Timewindow)	M	Indicates the time window(s) for which Background Data Transfer has been successfully activated.
<i>l4SEnabled</i>	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.
<i>qoSMonitoringEnabled</i>	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*.

11.3.1.3 Deactivate Dynamic Policy

The *deactivatePolicy()* method is invoked to request that the current dynamic policy is no longer applied to a media delivery session. 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 input parameters of the method are specified in table 11.3.1.3-1.

Table 11.3.1.3-1: Input parameters for deactivatePolicy() method

Name	Type	O	Description
<i>sessionId</i>	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.

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 11.3.1.3-2.

Table 11.3.1.3-2: Return value for deactivatePolicy() method

Name	Type	O	Description
—	boolean	M	An indication of whether the deactivation was successful (<i>true</i>) or not (<i>false</i>).

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
<i>currentDynamicPolicies[mediaDeliverySession]</i>	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
<i>POLICY_ACTIVATED</i>	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.
<i>POLICY_DEACTIVATED</i>	Triggered when the Dynamic Policy for this media delivery session is deactivated.	Media delivery session identifier, Service Operation Point reference.
<i>BACKGROUND_DATA_TRANSFER_OPPORTUNITY</i>	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.
<i>L4S_ENABLED</i>	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.
<i>QOS_MONITORING_ENABLED</i>	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
<i>QOS_MONITORING_RESULTS</i>	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
<i>ERROR_INVALID_SERVICE_OPERATION_POINT</i>	Triggered when the provided Service Operation Point reference is not valid for the media delivery session.	Media delivery session identifier, Service Operation Point reference.
<i>ERROR_UNAUTHORISED</i>	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.
<i>ERROR_BACKGROUND_DATA_TRANSFER</i>	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.

11.4 Network Assistance client API

11.4.1 Network Assistance methods

11.4.1.1 Bit rate recommendation request

The *requestBitRateRecommendation()* method is invoked to request a recommended bit rate for a service component of a media delivery session that is known to the Media Session Handler.

The input parameters of the method are specified in table 11.4.1.1 1.

Table 11.4.1.1-1: Input parameters for requestBitRateRecommendation() method

Name	Type	O	Description
<i>sessionId</i>	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.
<i>componentReference</i>	string	M	Identifying a service component of the media delivery session indicated by <i>sessionId</i> .

If it has not already done so, the Media Session Handler shall first create a Network Assistance Session for the application flow corresponding to the indicated service component using the operation specified in clause 5.3.4.2, citing the relevant Policy Template identifier and service component reference if a dynamic QoS policy has been activated for the media delivery session using the method specified in clause 11.3.1.2.

The Media Session Handler shall then invoke the operation specified in clause 5.3.4.4 to obtain the bit rate recommendation from the Media AF.

The anonymous return value of the method is specified in table 11.4.1.1-2.

Table 11.4.1.1-2: Return value for requestBitRateRecommendation() method

Name	Type	O	Description
—	object	C	A recommended bit rate for the media delivery session. Null if the method invocation is unsuccessful.
<i>recommendedDownlinkBitRate</i>	BitRate	M	The recommended downlink bit rate for the requested media delivery session.
<i>recommendedUplinkBitRate</i>	BitRate	M	The recommended uplink bit rate for the requested media delivery session.

11.4.1.2 Delivery boost request

The *requestDeliveryBoost()* method is invoked to request a temporary boost to the bit rate of a service component of a media delivery session that is known to the Media Session Handler.

NOTE: The duration and network QoS of the delivery boost is at the discretion of the Media Delivery System.

The input parameters of the method are specified in table 11.4.1.2-1.

Table 11.4.1.2-1: Input parameters for requestDeliveryBoost() method

Name	Type	O	Description
<i>sessionId</i>	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.
<i>componentReference</i>	string	M	Identifying a service component of the media delivery session indicated by <i>sessionId</i> .

If it has not already done so, the Media Session Handler shall first create a Network Assistance Session for the application flow corresponding to the indicated service component using the operation specified in clause 5.3.4.2, citing the relevant Policy Template identifier and service component reference if a dynamic QoS policy has been activated for the media delivery session using the method specified in clause 11.3.1.2.

The Media Session Handler shall then invoke the operation specified in clause 5.3.4.5 to request the delivery boost from the Media AF.

The return value of the method is specified in table 11.4.1.2-2.

Table 11.4.1.2-2: Return value for requestDeliveryBoost() method

Type	Description
Boolean	Set to true if the delivery boost is granted.

11.4.2 Network Assistance information

Table 11.4.2-1 specifies the status information that can be obtained from the Media Session Handler.

Table 11.4.2-1: Status Information relating to Network Assistance

Status	Type	Parameter	Definition

Table 11.4.2-2 provides a list of general notification events exposed by the Media Session Handler.

Table 11.4.2-2: Notification Events relating to Network Assistance

Event	Definition	Payload
<i>BIT_RATE_RECOMMENDATION</i>	Triggered when a bit rate recommendation is received from the Media AF or from the UE modem. The source of the recommendation is indicated as a parameter of the payload.	Media delivery session identifier, Recommendation source, Recommended downlink bit rate, Recommended uplink bit rate.

Table 11.4.2-3 provides a list of general error events exposed by the Media Session Handler.

Table 11.4.2-3: Error Events relating to Network Assistance

Status	Definition	Payload
<i>ERROR_BIT_RATE_RECOMMENDATION</i>	Triggered when there is an error when requesting a bit rate recommendation from the Media AF or from the UE modem. The source of the recommendation is indicated as a parameter of the payload.	Media delivery session identifier, Recommendation source.
<i>ERROR_DELIVERY_BOOST</i>	Triggered when there is an error when requesting a delivery boost from the Media AF or from the UE modem. The source of the recommendation is indicated as a parameter of the payload.	Media delivery session identifier, Recommendation source.

11.5 Consumption Reporting API

11.5.1 Consumption Reporting methods

No methods are exposed by the Media Session Handler in this release to control Consumption Reporting by the Media Session Handler.

11.5.2 Consumption Reporting information

Table 11.5.2-1 specifies the status information relating to Consumption Reporting that is exposed by the Media Session Handler.

Table 11.5.2-1: Status Information relating to Consumption Reporting

Status	Type	Parameter	Definition
<i>consumptionReport</i>	object		The most recently sent consumption report.

Table 11.5.2-2 provides a list of general notification events exposed by the Media Session Handler.

Table 11.5.2-2: Notification Events relating to Consumption Reporting

Status	Definition	Payload
<i>CONSUMPTION_REPORTING_ACTIVATED</i>	Consumption reporting has been activated.	Media delivery session identifier.
<i>CONSUMPTION_REPORTING_STOPPED</i>	Consumption reporting has been stopped.	Media delivery session identifier.
<i>NEW_CONSUMPTION_REPORT</i>	A new consumption report is available and has been sent.	Media delivery session identifier.

Table 11.5.2-3 provides a list of general error events exposed by the Media Session Handler.

Table 11.5.2-3: Error Events relating to Consumption Reporting

Status	Definition	Payload
<i>ERROR_CONSUMPTION_REPORTING</i>	Error in consumption reporting occurred.	Media delivery session identifier, Provisioning Session Id, Server address, HTTP response code Error message.

11.6 Metrics Reporting client API

11.6.1 Metrics Reporting methods

No methods are exposed by the Media Session Handler in this release to control Metrics Reporting by the Media Session Handler.

11.6.2 Metrics Reporting information

Table 10.6.2-1 specifies the status information relating to Metrics Reporting that is exposed by the Media Session Handler.

Table 11.6.2-1: Status Information relating to Metrics Reporting

Status	Type	Definition
<i>lastMetricsReport</i>	object	Status information relating to the last sent metrics report.
<i>provisioningSessionId</i>	ResourceId	The Provisioning Session identifier for this metrics report.
<i>metricsReportingConfigurationId</i>	ResourceId	The metrics reporting configuration identifier for this report.
<i>scheme</i>	Uri	The metrics reporting scheme used by this metrics report (see clause 5.3.5).
<i>metricsReport</i>	object	The most recently sent metrics report.

Table 11.6.2-2 provides a list of general notification events exposed by the Media Session Handler.

Table 11.6.2-2: Notification Events relating to Metrics Reporting

Event	Definition	Payload
<i>METRICS_REPORTING_ACTIVATED</i>	Metrics reporting has been activated.	Media delivery session identifier.
<i>METRICS_REPORTING_STOPPED</i>	Metrics reporting has been stopped.	Media delivery session identifier.
<i>NEW_METRICS_REPORT</i>	A new metrics report is available and has been sent.	Media delivery session identifier.

Table 11.6.2-3 provides a list of general error events exposed by the Media Session Handler.

Table 11.6.2-3: Error Events relating to Metrics Reporting

Error event	Definition	Payload
<i>ERROR_METRICS_REPORTING</i>	Error in metrics reporting occurred.	Media delivery session identifier, Provisioning Session Id, Server address, Metrics Reporting Configuration Id, HTTP response code Error message.

Details of status information for RAN-based metrics reporting are for further study.

Annex A (normative): OpenAPI representation of HTTP REST APIs

A.1 General

The normative code specifying the APIs defined in clauses 7.3, 8, 9 and 10 of the present document, including JSON Schema [38] representations of HTTP message bodies to be used with these APIs, is published on 3GPP Forge according to the OpenAPI 3.0.0 specification [32]. The YAML files corresponding to this version of the present document shall be published to the following location:

https://forge.3gpp.org/rep/all/5G_APIs/-/tags/TSG110-Rel19

Informative copies of these YAML files shall be distributed with the present document for convenience only. Where any discrepancy exists, the version on 3GPP Forge shall be considered definitive.

A.2 Data Types applicable to several APIs

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_CommonData.yaml".

A.3 OpenAPI representation of Maf_Provisioning APIs

A.3.1 Maf_Provisioning_ProvisioningSessions API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_ProvisioningSessions.yaml".

A.3.2 Maf_Provisioning_ContentProtocols API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_ContentProtocols.yaml".

A.3.3 Maf_Provisioning_ServerCertificates API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_ServerCertificates.yaml".

A.3.4 Maf_Provisioning_ContentPreparationTemplates API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_ContentPreparationTemplates.yaml".

A.3.5 Maf_Provisioning_EdgeResources API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_EdgeResources.yaml".

A.3.6 Maf_Provisioning_PolicyTemplates API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_PolicyTemplates.yaml".

A.3.7 Maf_Provisioning_ContentHosting API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_ContentHosting.yaml".

A.3.8 Maf_Provisioning_ContentPublishing API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_ContentPublishing.yaml".

A.3.9 Maf_Provisioning_RealTimeCommunication API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_RealTimeCommunication.yaml".

A.3.9 Maf_Provisioning_MetricsReporting API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_MetricsReporting.yaml".

A.3.10 Maf_Provisioning_ConsumptionReporting API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_ConsumptionReporting.yaml".

A.3.11 Maf_Provisioning_EventDataProcessing API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_Provisioning_EventDataProcessing.yaml".

A.4 OpenAPI representation of Maf_SessionHandling APIs

A.4.1 Maf_SessionHandling_ServiceAccessInformation API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_SessionHandling_ServiceAccessInformation.yaml".

A.4.2 Maf_SessionHandling_DynamicPolicy API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_SessionHandling_DynamicPolicy.yaml".

A.4.3 Maf_SessionHandling_NetworkAssistance API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_SessionHandling_NetworkAssistance.yaml".

A.4.4 Maf_SessionHandling_MetricsReporting API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_SessionHandling_MetricsReporting.yaml".

A.4.5 Maf_SessionHandling_ConsumptionReporting API

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Maf_SessionHandling_ConsumptionReporting.yaml".

A.5 OpenAPI representation of ancillary network media session handling services

A.5.1 Resource update notification channel

For the purpose of referencing entities specified in this clause, it shall be assumed that the OpenAPI definitions are contained in a physical file named "TS26510_Notifications.yaml".

Annex B (normative): Controlled vocabularies

B.1 Locator type

This controlled vocabulary is used to indicate the type of a locator in conjunction with the geofencing feature of the Content Hosting Configuration specified in clause 8.8.3.1.

Table B.1-1: Locator type controlled vocabulary

Term identifier	Term name	Semantic
<i>urn:3gpp:media-delivery:locator-type:iso3166</i>	ISO 3166 administrative area	String representation of an ISO 3166-1 alpha-2 country code [41] (e.g. <i>US</i> , <i>CN</i> , <i>KR</i> , <i>GB</i> , <i>FR</i>) or an ISO 3166-2 code [42] comprising an alpha-2 country code and a country subdivision code valid for that country (e.g. <i>US-CA</i> , <i>CN-GD</i> , <i>KR-26</i> , <i>GB-ENG</i> , <i>GB-WSM</i> , <i>FR-IDF</i> , <i>FR-75</i>).
<i>urn:3gpp:media-delivery:locator-type:trackingAreaCode</i>	3GPP Tracking Area Code	The Fully-Qualified Domain Name representation of a Tracking Area Code, as defined in clause 19.4.2.3 of TS 23.003 [16].

Annex C (informative): Usage of TOS/DSCP for traffic identification

C.1 General

This annex provides guidelines on the usage of the Type of Service (TOS) field of the IPv4 header or Traffic Class field of the IPv6 header for the purpose of traffic identification in the Media Delivery System as part of different features, such as Dynamic Policies and AF-based Network Assistance. The *differentiatedServicesCodePoint* property of the *IPPacketFilterSet* data type specified in clause 7.3.3.1 allows traffic filtering based on Differentiated Services Code Point (DSCP) values populated in this field within the IP header.

C.2 Differentiated Services/TOS-enabled Collaboration Scenarios

Differentiated Services (DS) as specified in RFC 2474 [43] is a scalable scheme for managing application traffic by classifying the traffic into a set of coarse-grained traffic classes. A *Differentiated Service (DS) domain* is a continuous set of DS-capable routers, which are operated with a common set of configurations. Each IP packet in a DS domain is marked and conditioned according to its traffic class. A 6-bit *DS Code Point* (DSCP) of the 8-bit differentiated services field (DS field) is used for marking. The DS field replaces the TOS field in the IPv4 packet headers and the Traffic Class field in the IPv6 header.

End host systems may mark IP packets with a specific DSCP value prior to transmission. DS-enabled routers treat the packet according to the DSCP value when performing routing operations on it. Border gateway routers typically mark packets with a DSCP value based on some traffic policy, overriding any value set by hosts.

NOTE: Usage of Differentiated Services across administrative borders is technically possible. The preservation of the DSCP field by networks between the MNO network and the external Data Networks hosting the Media Delivery functions is assumed to be governed by an SLA and by transport-level arrangements that are outside 3GPP scope. When the DSCP field is used only for traffic identification, preservation of the DSCP field could be achieved by using a tunnelling solution.

The RFCs defining Differentiated Services recommend a set of Per-Hop Behaviors (PHB), namely:

- *Default Forwarding (DF) PHB*, defined in section 4.1 of RFC 2474 [43], is used for traffic without special treatment.
- *Class Selector PHB*, defined in section 4.2.2.2 of RFC 2474 [43] is used for maintaining backwards compatibility with the IP precedence field of TOS.
- *Expedited Forwarding (EF) PHB*, defined by RFC 3246 [44], is dedicated to low loss or low latency traffic.
- *Assured Forwarding (AF) PHB*, defined by RFC 2597 [45], offers different levels of forwarding assurances.

The DS domain operator can also implement additional custom PHBs.

In the context of TOS-based traffic identification and separation, it is reasonable to assume the Data Network north of the UPF (N6) is DS-enabled. The 5G System is embedded in a larger DS domain, using same TOS values across multiple devices in order to provide Quality of Service Support like a DSCP-enabled link. However, it is not required to deploy DS capable routers for using in order to use the TOS field in the IP packet filter set for traffic identification.

According to clause 4.1 of TS 26.501 [4], the 5GMS functions may be deployed within the trusted Data Network or an external Data network. As noted above, DS Code Points are often reset at network domain borders, but not always. There may be deployments e.g., with localized Edge Computing or with direct peering realizations, where the DSCP values can be used up to the Media AF and/or Media AS in an external Data Network. In this case, the logical DS domain is extended to include those externally-deployed Media Delivery functions.

Figure C.2-1 illustrates a deployment with a DS domain between the 5G System and the Media Delivery functions deployed in the external DN. (The model is also valid for deployments in which the Media Delivery functions both reside in the trusted DN.)

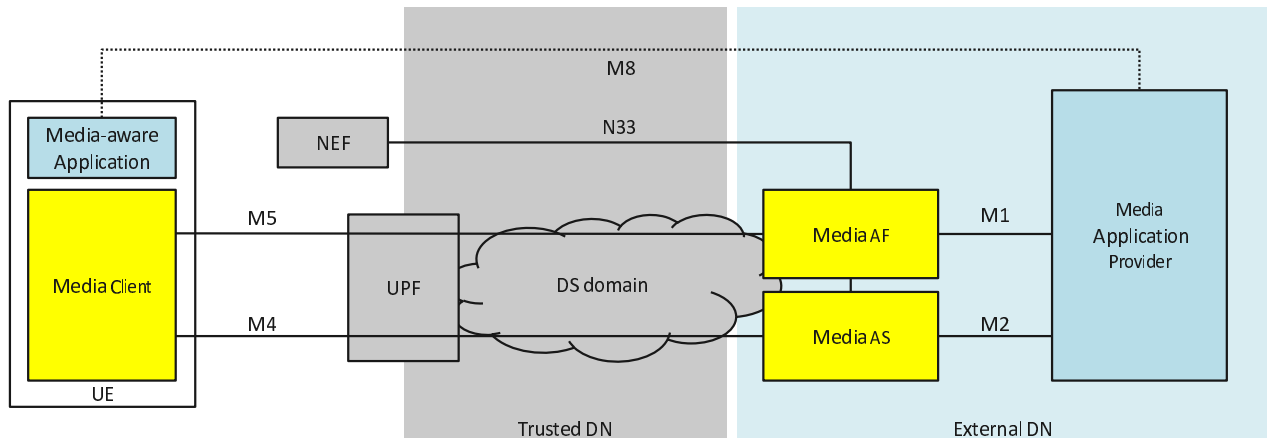


Figure C.2-1: Media Delivery System deployment within a DS domain

Figure C.2-2 illustrates a deployment with a DS domain between the 5G System and an externally deployed Media AS. The Media AF is deployed in the trusted DN.

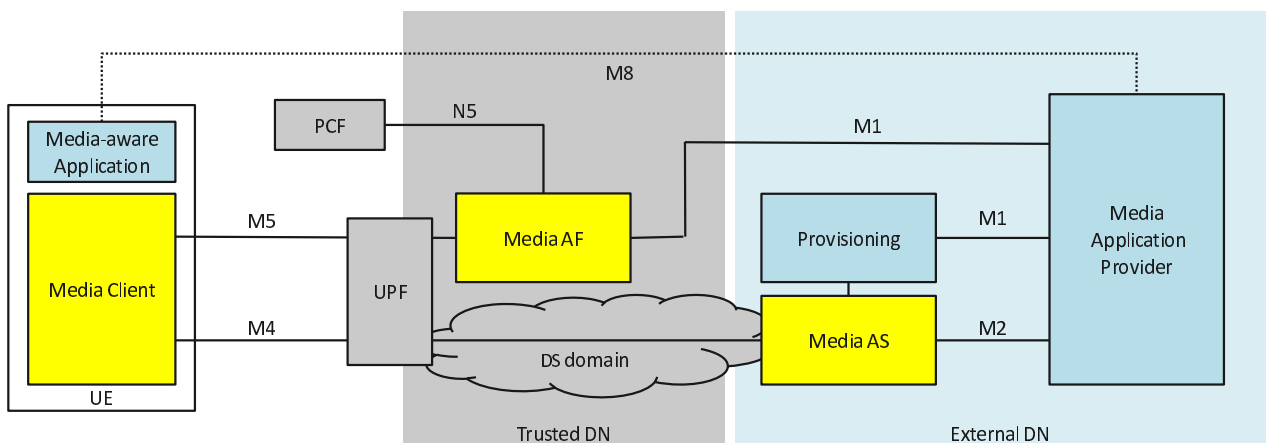


Figure C.2-2: Media Delivery System deployment within a DS domain

C.3 Procedure for using TOS Traffic Class for traffic identification

This call flow focuses on a scenario where both downlink and uplink traffic for a particular application flow within a PDU Session shared by several application flows needs to be mapped to a specific QoS Flow and handled separately by the 5G System. In this call flow, the Media Client initiates the QoS Flow establishment by using specific TOS values in the uplink traffic. A TOS-based QoS rule is already provisioned, so that the Uplink Traffic is mapped to the correct QoS Flow.

It is assumed here that the QoS flow should be used (e.g. for Premium QoS) as described in annex A of TS 26.501 [4].

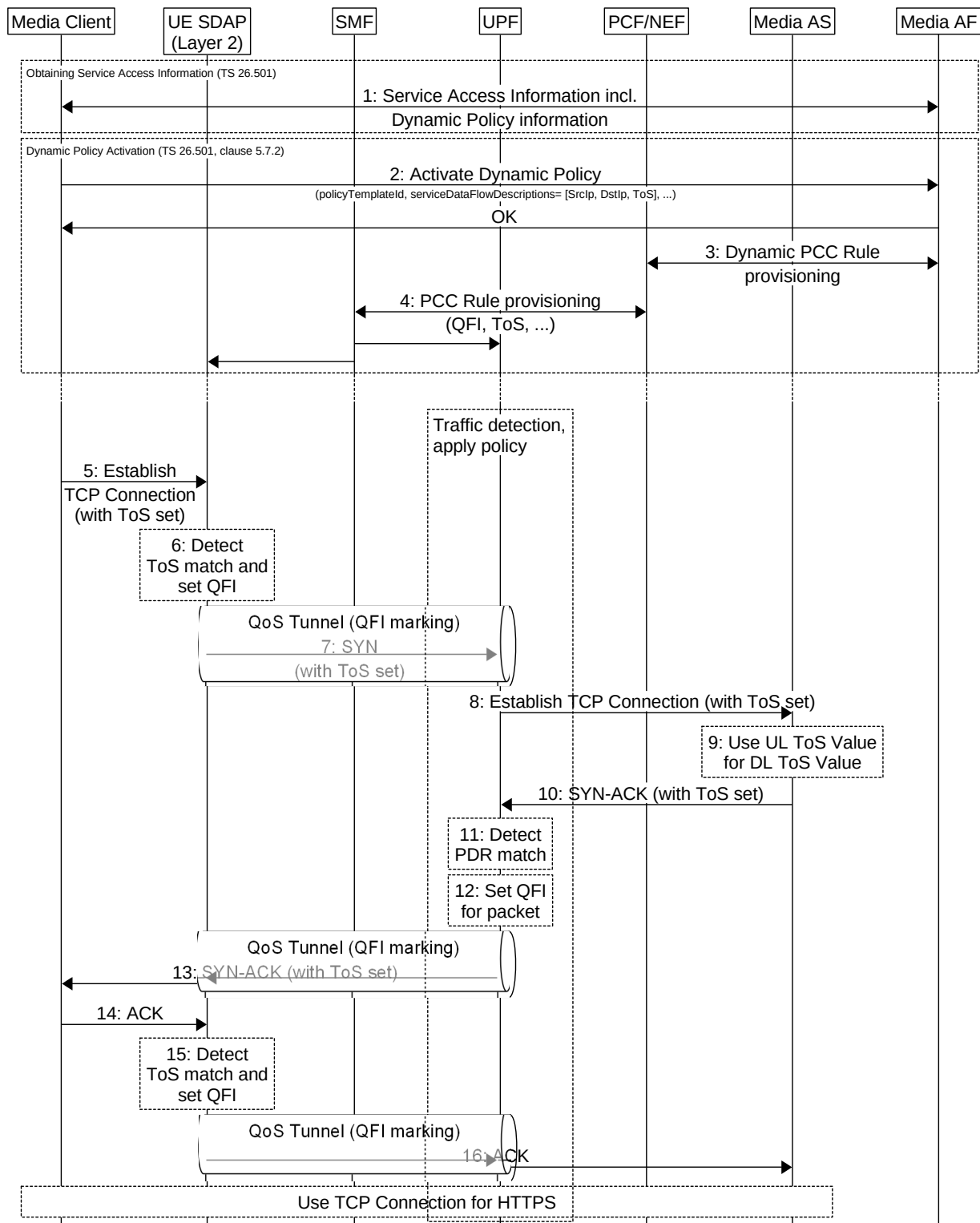

<https://gitlab.com/msc-generator/v8.4>

Figure C.3-1: High-level call flow for using TOS Traffic Class for traffic identification

Prerequisites:

- It is assumed that the Media Delivery System is already provisioned for Dynamic Policy usage as specified in clause 5.2.7 of the present document. As result, various functions of the 5G System are provisioned for QoS usage.

The steps are as follows:

1. The Media Delivery Client acquires Service Access Information (through reference points M8+M6 and/or M5 according to clause 5.3.2.3 of the present document), providing the information needed to use the Dynamic Policy API (see clause 5.3.3). Here, the *sdfMethod* indicates the usage of TOS.
2. The Media Delivery Client activates a Dynamic Policy (see clause 9.3). Each *applicationFlowBindings*.*applicationFlowDescription* contains a *packetFilter* object of data type *IpPacketFilterSet*, where the *srcIp*, *toSTc*, *dstIP* properties are present. The filter for a bi-directional application flow requires two such application flow bindings, one with *IpPacketFilterSet.direction* set to *in* and one with *IpPacketFilterSet.direction* set to *out*.
3. As a result of the previous step, the Media AF provisions the information for a Dynamic PCC rule with either the PCF or the NEF.
 - When using the NEF AF Session with required QoS API, the TOS value is provided within the *tosTC* attribute within the *FlowInfo* data type.
 - When using the PCF Policy Authorization Service API, the TOS value is provided within the *tosTrCI* attribution of the *MediaSubComponent* data type.
4. The PCF authorizes the request and creates a PCC rule. The PCF compiles and notifies the SMF about the PCC rule (containing the flow descriptions and providing parameters for policy control and/or charging control), has and the SMF forwards the QoS rule to the UE and (in the form of a PDR) to the UPF. The information contains, among other things, the QFI value and the TOS value.

During a media delivery session:

5. The Media Client initiates connection establishment by sending a TCP SYN packet. The TOS value in the TCP SYN packet is set by the Media Client to the same value as provided to the Media AF in earlier step 2.
6. The UE SDAP entity detects a matching TOS value in the uplink traffic.
7. The UE SDAP entity (Layer 2) encapsulates the IP packet into the according radio protocols, including the QFI marking.
8. The Media AS reads the TOS value from the uplink packet. The Media AS uses the uplink TOS value to mark all downlink packets in that TCP connection.

NOTE: When the 5G System employs an N6 NAT, the N6 NAT may set the downlink TOS value to the same value as the uplink TOS value.

9. The Media AS marks its acknowledgement IP packet (conveying the TCP SYN-ACK) with the same TOS value as the incoming packet.
10. The Media AS sends the TCP SYN-ACK packet back to the UE. The packet reaches the UPF on its path to the UE.
11. The UPF detects a match for the PDR rule configured in step 4 above containing the UE's IP address and TOS value.
12. The UPF encapsulates the downlink IP packet into an GTP-U packet, and sets the QFI value in the GTP-U packet header.
13. The UPF sends the GTP-U-encapsulated packet to the RAN via reference point N3 and the RAN marks the QFI value in the SDAP layer, sending the packet to the UE. The UE SDAP entity (Layer 2) forwards the TCP SYN-ACK to the 5GMS Client.
14. The Media Client sends the TCP ACK (again with the TOS field set in the IP header) to complete the TCP connection handshake.
15. The UE SDAP entity (Layer 2) detects a TOS match for the UE.
16. The UE SDAP entity (Layer 2) encapsulates the IP packet into the according radio protocols, including the QFI marking.

The Media Client continues to use the established TCP connection.

Annex D (informative): QoS mappings at reference point N5/N33

D.1 QoS mappings for Dynamic Policy

D.1.1 General

This clause presents mappings between the *DynamicPolicy* resource specified in clause 9.3.3.1 of the present document and the *ApplicationSessionContext* resource specified at reference point N5 in TS 29.514 [18] (see clause D.1.2 below), as well as with the equivalent *AsSessionWithQosSubscription* resource specified for use with the NEF at reference point N33 in TS 29.522 [19] and TS 29.122 [20] (see clause D.1.3 below).

The following common aspect apply to all the mappings described in this clause:

1. Each abstract *Application Service* is realised by a *Provisioning Session* in the Media Delivery System when a *ProvisioningSession* resource is created by the Media Application Provider in the Media AF at reference point M1. The Application Service is uniquely identified in the Media Delivery System by an *external service identifier* which is realised by the *externalServiceId* property of the *ProvisioningSession* resource.
2. Each abstract *Service Operation Point* of an Application Service is realised in the Media Delivery System by a *Policy Template* when a *PolicyTemplate* resource created by the Media Application Provider in the Media AF at reference point M1. The Service Operation Point is uniquely identified in the scope of its parent Provisioning Session by an *external reference* which is realised by the *externalReference* property of the *PolicyTemplate* resource.
3. Each abstract *Service Component* of a parent Service Operation Point is realised by a *PolicyConstraints* object in the *DynamicPolicy* resource. The Service Component is uniquely identified in the scope of its parent Service Operation Point by a *component reference* that is realised by the *componentReference* property of the *Policy Constraints* object.

The Service Component may reference an existing QoS policy in the PCF by populating the *qosReference* property of the *PolicyConstraints* resource with the identifier of the existing QoS policy. Alternatively, QoS ranges for the downlink and uplink directions may instead be specified explicitly using the *downlinkQos Specification* and/or *uplinkQosSpecification* properties.

4. A Policy Template is instantiated when the Media Session Handler creates a *DynamicPolicy* resource at reference point M5. The Policy Template is identified in the *dynamicPolicyId* property of the *DynamicPolicy* resource.

Any number of Dynamic Policy Instances may be associated at the same time with an abstract media delivery session. Each media delivery session is uniquely identified in the Media Delivery System by a *media delivery session identifier* which is cited in the *sessionId* property of the *DynamicPolicy* resource.

Each Service Component in the Dynamic Policy Instance is described by an *ApplicationFlowBinding* object in the *applicationFlowBindings* array of the *DynamicPolicy* resource:

- a. The *applicationFlowDescription* property describes the traffic belonging to the Service Component, either in terms of specific protocol header values (e.g. IP 3-tuple, 5-tuple), or else in terms of a domain name.
- b. The *qosSpecification* property specifies the Media Session Handler's QoS requirements for the Service Component in the downlink and/or uplink direction. The QoS requirements are expressed in terms of bit rates as well as targets for packet latency and packet loss.
- c. The *componentReference* property identifies which provisioned *PolicyConstraints* of the Policy Template (see 3 above) is applicable. This is used by the Media AF to constrain the Media Session Handler's QoS requirements for the Service Component.

The Application Flow Description is used by the 5G Core to construct a downlink Packet Detection Rule (PDR) in the UPF for the Service Component in question and to signal an uplink rule to the UE modem via the control plane.

The Media Session Handler's QoS requirements, as constrained by the QoS range of the referenced Policy Template and Service Component, are used by the 5G Core to construct a corresponding QoS Enforcement Rule (QER) in the UPF for the Service Component in question.

D.1.2 QoS mapping for Dynamic Policy at reference point N5

When the Media AF directly invokes the *Npcf_PolicyAuthorization* service at reference point N5 according to TS 29.514 [18], each *DynamicPolicy* resource is mapped by the Media AF to an *ApplicationSessionContext* resource in the PCF.

Two alternative implementation options exist for the mapping of the *ApplicationFlowBinding* object by the Media AF:

1. Each *ApplicationFlowBinding* object of the Dynamic Policy Instance (each one representing a distinct Service Component) is associated with a different *MediaComponent* object in the PCF, as shown in figure D.1.2-1. A single *MediaSubComponent* is created to describe the downlink and/or uplink aspects of that Service Component.

NOTE 1: As specified in clause 5.5.3.3.3, the dynamic traffic characteristics (i.e., data burst size, time to next burst and expedited transfer indication) are mapped to the *datBurstSizeInd*, *timetoNextBurstInd*, and *expTranInd* properties respectively of a *MediaComponent* object. These reflect the values of corresponding *PolicyConstraints* properties *downlinkDataBurstSizeMarkingRequired*, *downlinkTimeToNextBurstMarkingRequired*, and respectively, of the corresponding *ApplicationFlowBinding*'s client QoS specification of *downlinkExpeditedTransferIndication*. When any of these are present, the *mediaTransportParameters* are further associated with the *protoDescDI* property of the *MediaComponent* object.

2. In the limited case where all Service Components share the same minimum desired bit rate, minimum requested bit rate, PDU Set QoS requirements and dynamic traffic characteristics (data burst size and/or time to next burst) marking, and none of the *PolicyConstraints* objects cites a *qosReference*, each *ApplicationFlowBinding* object of the Dynamic Policy Instance (each one representing a distinct Service Component) is associated with a different *MediaSubComponent* object in the PCF, and these all share a common parent *MediaComponent* object, as shown in figure D.1.2-2.

NOTE 2: The dynamic traffic characteristic of expedited transfer indication is not applicable to this limited case as different QoS requirements are expected between corresponding expedited and non-expedited *ApplicationFlowBinding* objects.

In both options, the descriptions of the downlink and/or uplink application flow are populated in the *fDescs* array of the *MediaSubComponent* unless a *qosReference* is cited in the corresponding *PolicyConstraints*.

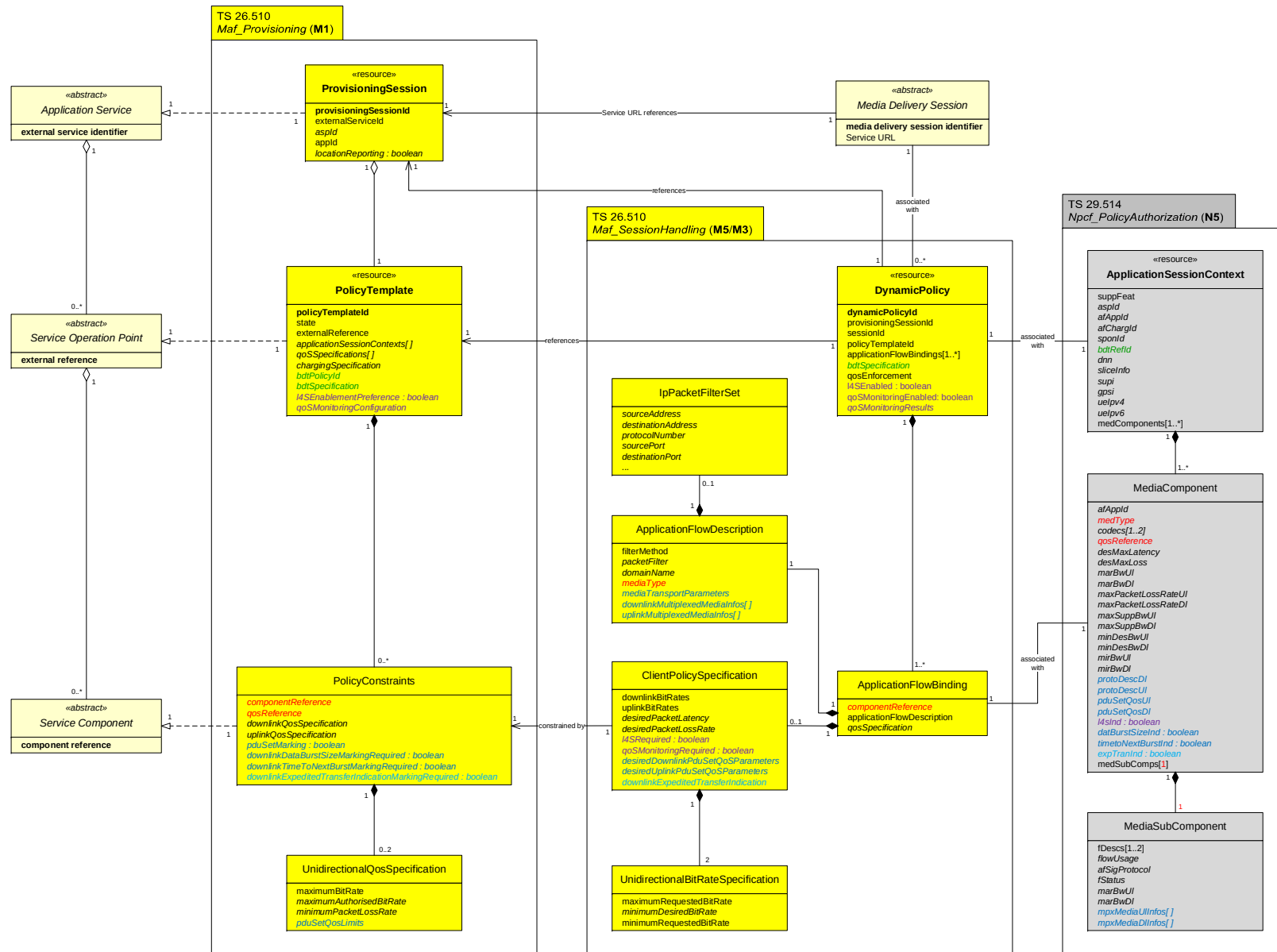


Figure D.1.2-1: General case mapping of *ApplicationFlowBinding* to PCF *MediaComponent* at reference point N5

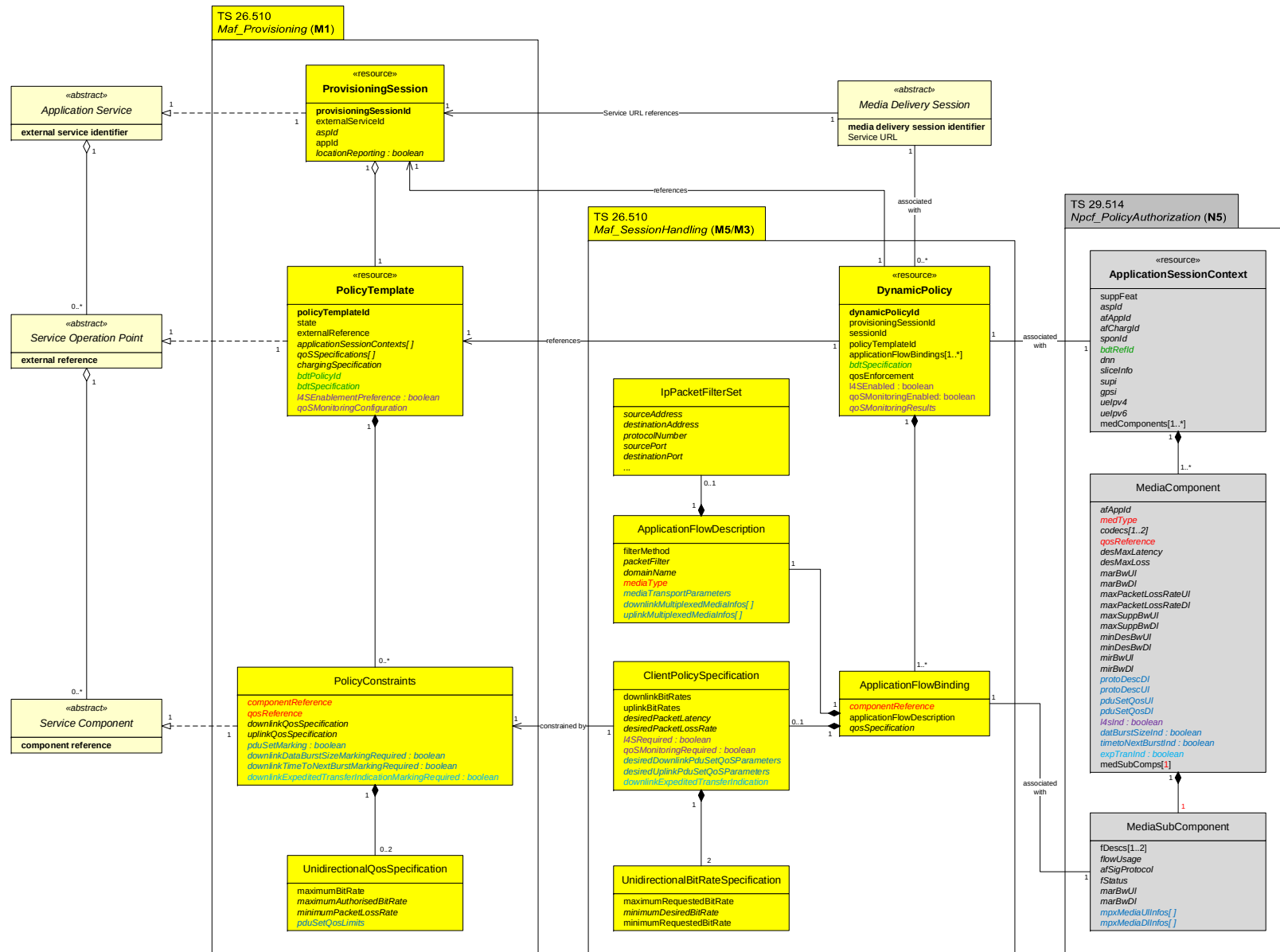


Figure D.1.2-2: Limited case mapping of *ApplicationFlowBinding* to PCF *MediaSubComponent* at reference point N5

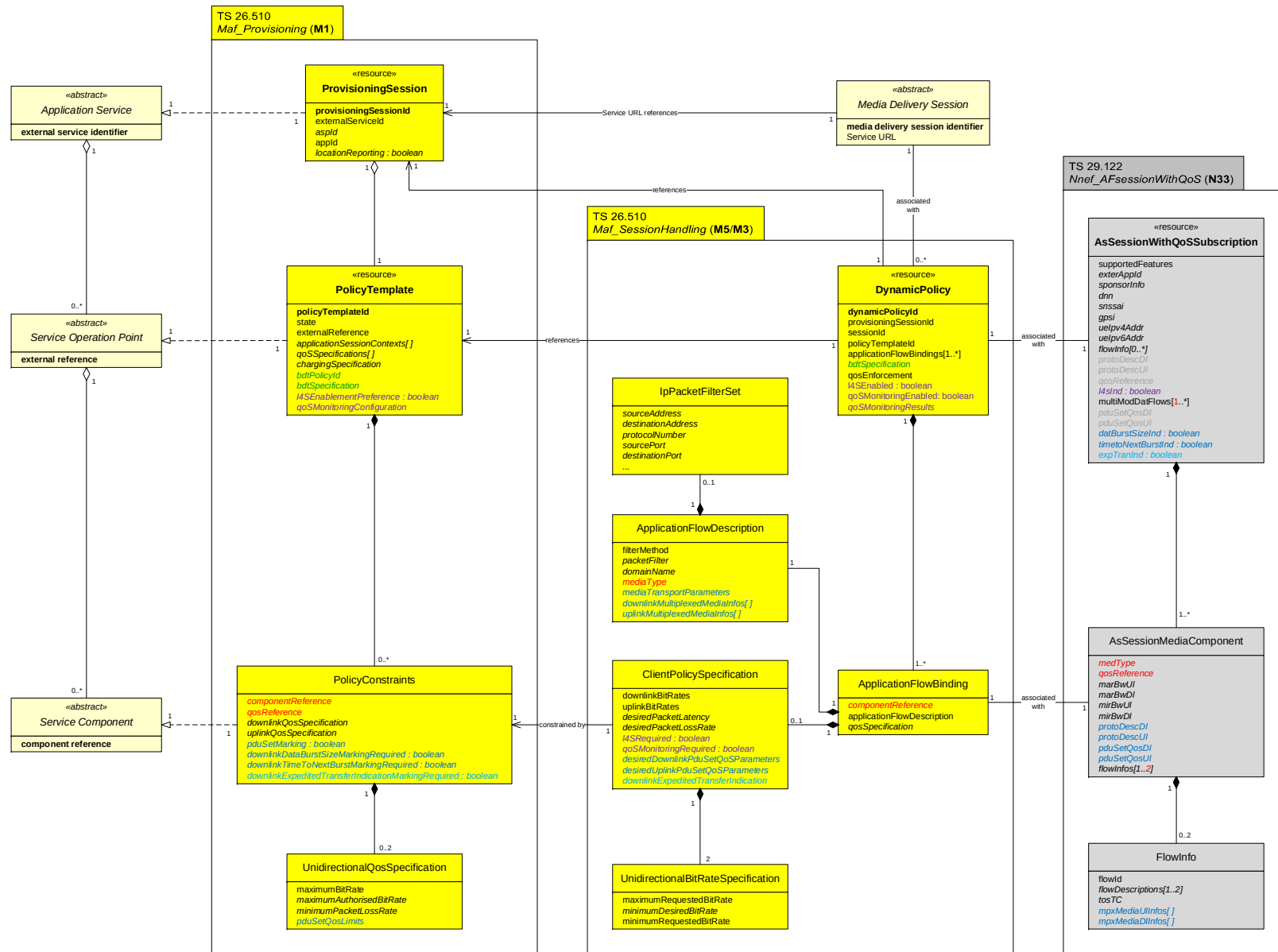
D.1.3 QoS mapping for Dynamic Policy at reference point N33

When the Media AF invokes the *Nnef_AFsessionWithQoS* service at reference point N33 according to TS 29.522 [19] and TS 29.122 [20], each *DynamicPolicy* resource is mapped by the Media AF to an *AsSessionWithQoSSubscription* resource in the NEF. The *qosReference*, *protoDescDL*, *protoDescUL*, *pduSetQosDL* and *pduSetQosUL* properties are not populated in this resource; the QoS requirements of the Service Component are instead populated in the *AsSessionMediaComponent* object.

Each *ApplicationFlowBinding* object of the Dynamic Policy Instance (each one representing a distinct Service Component) is associated with a different *AsSessionMediaComponent* object in the NEF, as shown in figure D.1.3-1.

The QoS requirements of the Service Component are instead populated in the *AsSessionMediaComponent*.

The descriptions of the downlink and/or uplink directions of the application flow corresponding to the Service Component are populated in the *flowInfos* array of the *AsSessionMediaComponent* unless a *qosReference* is cited in the corresponding *PolicyConstraints* object.

Figure D.1.3-1: Mapping of *ApplicationFlowBinding* to NEF *AsSessionMediaComponent* at reference point N33

Annex E (normative): IANA registrations

E.1 General

This annex provides the formal registrations of MIME media types for different resources specified in the present document. Each registration is referenced from the registry at <http://www.iana.org/assignments/media-types>.

E.2 Registration of MIME media type for JSON-based media delivery metrics reporting envelope

E.2.1 General

The MIME media type specified in table E.2.1-1 below denotes that the message body is a JSON instance document compliant with the JSON-based media delivery metrics reporting envelope, the syntax of which is specified in clause 9.5.3.2.

**Table E.2.1-1: MIME media type registration for
JSON-based media delivery metrics reporting envelope**

Parameter		Value
MIME media type name		<i>application</i>
MIME subtype name		<i>3gpp-media-delivery-metrics-report+json</i>
Required parameters		<i>version</i> (see clause E.2.2 of 3GPP TS 26.510).
Optional parameters		None.
Encoding considerations		This is a JSON document, and the encoding considerations are the same as for media type <i>application/json</i> defined in IETF RFC 8259.
Security considerations		This media format is used to report Quality of Experience metrics in 3GPP Media Delivery Systems such as the 5G Media Streaming (5GMS) System. This format is highly susceptible to manipulation or spoofing for attacks designed to inject fake metrics. Both integrity protection and source authentication are recommended to prevent misleading of the recipient.
Interoperability considerations		The specification defines a platform-independent metrics reporting document format, and it is intended that wide interoperability can be achieved.
Published specification		3GPP TS 26.510 clause 9.5.3.2
Applications which use this media type		3GPP 5GMS-based applications and services
Fragment identifier considerations		The provisions of RFC 6901 (JSON Pointer) apply.
Restrictions on usage		None
Provisional registration?		No
Additional information	Deprecated alias names	None
	Magic number(s)	None
	File extension(s)	<i>json</i>
	Macintosh File Type Code(s)	None
	Object Identifier(s) of OID(s)	None
Intended usage		COMMON
Other information and comments		None
Contact person	Contact name	Dongwook Kim
	Contact e-mail address	dongwook.kim@etsi.org
	Author/Change controller	3GPP TSG SA WG4

E.2.2 Version parameter

Table E.2.2-1 specifies the *version* parameter to be used with the MIME media type registration in clause E.2.1.

Table E.2.2-1: Specification of version parameter

Parameter	Value
Parameter name	<i>version</i>
Parameter value	A comma-separated list of versions of the Metrics Report schema to which the document conforms. The value is specified in clause 9.5.3.2 of 3GPP TS 26.510 and encodes the last 3GPP release in which a change to the document schema was approved. The purpose of the parameter is to allow schema conformance to be assessed by a recipient before attempting to parse the contents of a received document.

EXAMPLE: application/3gpp-media-delivery-metrics-report+json;version="**Rel19**"

Annex F (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2023-08-24	SA4#125	S4-231500	-	-	-	Initial document skeleton proposal.	0.0.1
2024-01-18	ad hoc post SA4#126	S4aI230209	-	-	-	Clean version agreed as the basis of further work.	1.0.2
2024-05-24	SA#128	S4-241306				Numbered references. S4-241196: UE media session handling client API (M6). S4-241270: OAuth 2.0 security. S4-241264: Service URL. S4-241147: MQTT notification channel. S4-241347: RTC additions to operations and APIs.	1.3.0
2024-06						Version 2.0.0 created by MCC	2.0.0
2024-06						Version 18.0.0 created by MCC	18.0.0
2024-06						Attachments added to the zip file	18.0.1
2024-06						Formatting fix	18.0.2
2024-09	SA#105	SP-241108	0001	1	F	[5GMS_Pro_Ph2] Cache control metadata in MQTT notification message	18.1.0
2024-09	SA#105	SP-241108	0002	2	F	[5GMS_Pro_Ph2] Network Assistance Client API completion	18.1.0
2024-09	SA#105	SP-241108	0003	1	F	[5GMS_Pro_Ph2] Data type corrections and renaming	18.1.0
2024-09	SA#105	SP-241108	0004	1	D	[5GMS_Pro_Ph2] QoS mapping at N5/N33	18.1.0
2024-09	SA#105	SP-241108	0005	-	F	[5GMS_Pro_Ph2] Essential corrections	18.1.0
2024-09	SA#105	SP-241108	0006	1	F	[5GMS_Pro_Ph2]: Correction of OAuth access token usage by the Media AF	18.1.0
2024-09	SA#105	SP-241113	0007	1	F	[iRTCW] Metrics reporting configuration alignment with RTC	18.1.0
2025-01	SA#106	SP-241748	0009	3	F	[iRTCW, 5GMS_Pro_Ph2] Authorising Media AS access to the Media AF at reference point M3	18.2.0
2025-01	SA#106	SP-241742	0010	1	F	[5GMS_Pro_Ph2] Completion of media session handling client API for Background Data Transfer	18.2.0
2025-01	SA#106	SP-241747	0011	1	F	[iRTCW] Clarifications on consumption reporting	18.2.0
2025-01	SA#106	SP-241742	0012	1		[5GMS_Pro_Ph2] Refactor YAML at M1 to allow M3 to be different	18.2.0
2025-03	SA#107	SP-250130	0013	1	F	[5GMS_Pro_Ph2] Explicit deactivation of Dynamic Policy in client API	18.3.0
2025-03	SA#107	SP-250130	0014	1	F	[5GMS_Pro_Ph2] Editorial correction	18.3.0
2025-06	SA#108	SP-250697	0025		F	[5GMS_Pro_Ph2] Correction to the Dynamic Policy resource definition	18.4.0
2025-06	SA#108	SP-250697	0028	1	F	[5GMS_Pro_Ph2] Content Hosting and Publishing Corrections	18.4.0
2025-06	SA#108	SP-250698	0024	1	F	[iRTCW, 5GMS_Pro_Ph2] Correction to Dynamic Policy Instance creation	18.4.0
2025-06	SA#108	SP-250698	0026	1	F	[iRTCW, 5GMS_Pro_Ph2] Correction of Media AF Handling of PDU Set QoS and Media Transport Parameters	18.4.0
2025-06	SA#108	SP-250566	0029		F	Update of info and externalDocs fields	18.4.0
2025-09	SA#109	SP-250922	0030	4	F	[5GMS_Pro_Ph2] Rename dynamic policy data types	18.5.0
2025-09	SA#109	SP-250922	0035	3	F	[5GMS_Pro_Ph2] Content Hosting Corrections	18.5.0
2025-09	SA#109	SP-251149	0032	3	B	[AMD_PRO-MED, 5G RTP_Ph2] Consolidated additions	19.0.0
2025-12	SA#110	SP-251436	0036	1	F	[AMD_PRO-MED, 5G RTP_Ph2] Essential corrections	19.1.0
2025-12	SA#110	SP-251443	0037	2	F	[AMD_PRO-MED] Corrections to ContentHostingConfiguration and ContentContributionConfiguration OpenAPI Schema	19.1.0
2025-12	SA#110	SP-251443	0038	-	F	[AMD_PRO-MED] Security procedures for metrics reporting at M3	19.1.0

History

Version	Date	Status
V19.0.0	October 2025	Publication
V19.1.0	February 2026	Publication