**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | **Media delivery from multiple service endpoints/locations:** Content distributors often use multiple Content Delivery Networks (CDNs) to distribute their content to end-users. As an example, they may upload a copy of their catalogue to each CDN, or more commonly have all CDNs pull the content from a common origin. In advanced deployments, technologies such as Coded Multisource Media Format (CMMF) use Application Layer FEC techniques to stripe different subsets of content across multiple CDNs. Different client implementations may then beneficially use the content on multiple CDNs, potentially guided by the service or network provider. Integration of these different technologies into the Media Delivery System is of relevance to address content provisioning, content hosting, impacts on reference points, as well as potential benefits in terms of quality and resource usage. | | | | | | | | |
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| ***Summary of change:*** | | *Media delivery from multiple service endpoints/locations* as introduced in clause 5.19 and based on the conclusions in clause 6.19 of TR 26.804:  i. Document the generic MIME content types and references to valid profiles or relevant external specifications for Content Preparation Templates used for the purposes of multi-source/service location content preparation (item 2 of clause 5.19.7 of TR 26.804).  ii. Extend the ContentHostingConfiguration resource to allow Content Distributions to be declared in hierarchical or peer-to-peer configurations (item 4 of clause 5.19.7 of TR 26.804).  iii. Extend the ContentHostingConfiguration resource to allow the 5GMSd Application Provider the capability to influence the configuration and deployment of Content Distributions with the 5GMSd AS at the time of provisioning (item 5 of clause 5.19.7 of TR 26.804).  iv. Clarify the use of the Media Entry Point for the purposes of communicating service location and multi-source/service location configuration information to 5GMSd Clients (item 6 of clause 5.19.7 of TR 26.804).  v. Clarify the expectation that the Media Player natively supports the multi-source/service location approach in use (item 8 of clause 5.19.7 of TR 26.804)  vi. Introduce CMMF in TS 26.511 as a format for delivering media from multiple service locations including possible definition of CMMF profiles for use in 5GMS.  vii. Introduce Content Steering as an M4 API in TS 26.512 and for use with 3GP-DASH (TS 26.247 [26]).  viii. Support other relevant aspects resulting from stage-2. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Feature not supported | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.2.1, 5.2.3.1, 5.2.3.2, 5.2.3.3, 5.2.5.1, 5.2.8.2, 5.2.8.6, 8.3.3.1, 8.3.3.2, 8.5.1, 8.8.3.1, 9.2.3.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 26.511 CR 0014, TS 26.512 CR 0086, TS 26.247 CR 0190 | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

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# 2 References

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[52] ETSI TS 103 973: "Coded Multisource Media Format (CMMF) for Content Distribution and Delivery", October 2024.

[53] 3GPP TS 26.511: "5G Media Streaming (5GMS); Profiles, Codecs and Formats".

[54] IETF 5053: "Raptor Forward Error Correction Scheme for Object Delivery", October 2007.

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## 3.3 Abbreviations

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CMMF Coded Multisource Media Format

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## 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.

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 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.

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### 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 egest 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.

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### 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. 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.

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#### 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 Media AS instance 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:

- 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. During provisioning of the Content Hosting Configuration, the Media AF associates one or more 5GMS AS service locations exposed at reference point M4 to every distribution. Service locations may be associated to one or more distributions at the discretion of the Media AF with guidance from the Media Application Provider as described below.

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

- The Media Application Provider may further use the DistributionConfiguration.affinityGroup property to indicate to the Media AF that service locations associated with one distribution configuration may or may not be associated with another distribution configuration that is assigned to the same or a different affinity group respectively.

- In all cases, the DistributionConfiguration.‌canonicalDomainName and DistributionConfiguration.‌baseURL properties are read-only: they 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 Hosting Configuration resource representation, or by using the operation specified in clause 5.2.8.3 below.

- 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 defined distribution configuration; and the Media AF shall provide the Media Entry Point to Media Client at reference point M5 within the Service Access Information (see clause 9.2.3.1). The RelativeMediaEntryPoint.‌profiles array may optionally specify service descriptions that allow Media Clients to match the Media Entry Point with a Policy Template that describes a set of media streaming parameters (e.g., bit rate, target latency) that realises a Service Operation Point. The RelativeMediaEntryPoint.‌relativePath property points to a Media Entry Point document resource that may describe:

- A single content item such as a MPD for DASH content, URL to a video clip file, or a document with pointers to a single content item. The Media Entry Point may additionally include service configuration information such as location and configuration information for the purposes of accessing the content from multiple service locations either hosted by the Media AS or the Media Application Provider.

- A downlink streaming session configuration that applies to multiple content items (e.g., content items selected from a catalogue by the Media-aware Application). This downlink streaming session configuration may include service configuration information such as location and configuration information for the purposes of accessing content from multiple service locations either hosted by the Media AS or the Media Application Provider.

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.

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#### 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 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 reference point M2 or by 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.

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#### 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:

- 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 the Media AS at reference point M4:

- 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.

- The Media AF associates one or more 5GMS AS service locations exposed at reference point M4 to every contribution configuration during provisioning of the Content Publishing Configuration. Service locations may be associated to one or more contribution configurations at the discretion of the Media AF with guidance from the Media Application Provider as described below.

- Every contribution configuration shall be assigned an identification label, unique within the scope of the parent Content Publishing Configuration, in the ContributionConfiguration.contributionId property. This can then be referenced from other resources in the Provisioning Session, such as a Content Preparation Template (see clause 5.2.5).

- The Media Application Provider may further use the ContributionConfiguration.affinityGroup property to indicate to the Media AF that service locations associated with one contribution configuration may or may not be associated with another contribution configuration that is assigned to the same or a different affinity group respectively.

- In all cases, the contributionConfiguration.‌canonicalDomainName and contributionConfiguration.‌baseURL properties are read-only: they 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.

- 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 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.

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.

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### 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 |
| --- | --- | --- | --- |
| *downlinkIngestProtocols* | array(Content‌Protocol‌Descriptor) | 0..1 | A set of ContentProtocolDescriptor 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. |
| *uplinkEgestProtocols* | array(Content‌Protocol‌Descriptor) | 0..1 | A set of ContentProtocolDescriptor 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. |
| *downlink‌Distribution‌Protocols* | array(Content‌Protocol‌Descriptor | 0..1 | A set of ContentProtocolDescriptor objects, as specified in clause 8.3.3.2, each one uniquely identifying a distribution protocol supported at reference point M4 by the Media AS associated with the parent Provisioning Session.  If present, the array shall contain at least one member. |
| *uplink‌Contribution‌Protocols* | array(Content‌Protocol‌Descriptor | 0..1 | A set of ContentProtocolDescriptor objects, as specified in clause 8.3.3.2, each one uniquely identifying a contribution protocol supported at reference point M4 by the Media AS associated with the parent Provisioning Session.  If present, the array shall contain at least one member. |
| *geoFencingLocatorTypes* | 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 and M10 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 |
| termIdentifier | Uri | 1..1 | A fully-qualified term identifier indicating support for a content protocol (see NOTE). |
| descriptionLocator | 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]. | | | |

## ===== CHANGE =====

## 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 M2d or M10d for distribution via reference point M4d service locations, or to uplink media resources contributed at reference point M4u for egest at reference point M2u or M10u. 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.

## ===== CHANGE =====

### 8.5.3 Data model

The data model of the Content Preparation Template resource shall be determined by its MIME content type. Defined Content Preparation Template resources are provided in annex E.

## ===== CHANGE =====

### 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 |
| --- | --- | --- | --- | --- | --- | --- |
| name | | | | string | 1..1 | A name for this Content Hosting Configuration. |
| ingestConfiguration | | | | Ingest‌Configuration | 1..1 | Parameters for ingesting media content into the Media AS at reference points M2 or M10. |
|  | mode | | | Content‌Transfer‌Mode | 1..1 | Indicates whether media content is pulled by the Media AS from the Media Application Provider's origin server at reference point M4 or from another Media AS at reference point M10; or pushed into the Media AS by the Media Application Provider (see clause 7.3.4.5). |
|  | protocol | | | 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]. |
|  | baseURL | | | 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 (mode is set to PULL), the base URL shall be provided to the Media AF 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 (mode is set to PUSH), 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. |
| distributionConfigurations | | | | array(Distribution‌Configuration) | 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. |
|  | distributionId | | | 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 chosen by the Media AF when the Content Hosting Configuration is provisioned. It is an error for the Media Application Provider to set this. |
|  | affinityGroup | | | string | 0..1 | The Media Application Provider may assign an affinity group label indicating that reference point M4 service locations exposed by this distribution configuration are to be deployed with service locations exposed by other distribution configurations with the same affinity group label. Service locations exposed by distribution configurations with different affinity group labels are not intended to be deployed together.  If this property is omitted, deployment of service locations for this distribution configuration is at the discretion of the Media AF. |
|  | supplementary‌Distribution‌Networks | | | 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 DistributionNetworkType value shall appear at most once in this array. |
|  | edgeResources‌ConfigurationId | | | 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. |
|  | content‌Preparation‌TemplateId | | | 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. |
|  | certificateId | | | 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. This attribute indicates the identifier of the certificate to use. |
|  | canonical‌Domain‌Name | | | string | 1..1 | All resources exposed from service locations at reference point M4 shall be accessible through this default Fully-Qualified Domain Name assigned by the Media AF. |
|  | domainNameAlias | | | 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 reference point M4 service locations.  This domain name is used by the Media AS to set appropriate CORS HTTP response headers sent from reference point M4 service locations.  If this property is present, the Media Application Provider is responsible for providing in the DNS a CNAME record that resolves domainNameAlias to canonical‌Domain‌Name.  If the certificateId property is also present in this distribution configuration, the provided domain name alias shall match one of the subjectAltName extension fields in the referenced Server Certificate resource, allowing for wildcard matching. |
|  | baseURL | | | 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 for this distribution configuration.  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. |
|  | entryPoint | | | 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 clause 5.2.8.2 and 7.3.3.12).  Omitted when this distribution configuration describes multiple content items. |
|  |  | relativePath | | 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 ingestConfiguration.protocol.  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. |
|  |  | contentType | | string | 1..1 | The MIME content type of the Media Entry Point.  Used by the Media Client to select a Media Entry Point. |
|  |  | protocol | | Uri | 0..0 | This property shall not be present in a distribution configuration. |
|  |  | profiles | | 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. |
|  | pathRewriteRules | | | 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 locations 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. |
|  |  | requestPathPattern | | 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 mappedPath shall be applied. |
|  |  | mappedPath | | string | 1..1 | A replacement for the portion of the Media AS request path that matches requestPathPattern.  In the case of pull-based content ingest, ingestConfiguration.entryPoint 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, canonical‌Domain‌Name (and, optionally, domain‌Name‌Alias) 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. |
|  | cachingConfigurations | | | array(Caching‌Configuration) | 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. |
|  |  | urlPatternFilter | | 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]. |
|  |  | cachingDirectives | | object | 1..1 | If a urlPatternFilter applies to a resource, then the provided cachingDirectives shall be applied by the Media AS to resources served through reference point M4 service locations, potentially overwriting any origin caching directives provided by the Media Application Provider when that resource is ingested at reference point M2 or M10. |
|  |  |  | statusCodeFilters | array(integer) | 0..1 | The set of HTTP origin response status codes at reference point M2 or M10 to which these cachingDirectives apply.  If the property is present, the array shall contain at least one item.  If absent, the enclosing cachingDirectives shall apply to all HTTP origin response status codes. |
|  |  |  | noCache | boolean | 0..1 | If set to true, 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 reference point M4 service locations.  Default value if omitted: false. |
|  |  |  | maxAge | 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 noCache is false, 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 noCache is false and if omitted, ingested media resources shall be cached indefinitely until the Content Hosting Configuration is destroyed by the Media Application Provider or until the available caching resources in the Media AS are exhausted, whichever is sooner. |
|  | geoFencing | | | object | 0..1 | Directives limiting access to the content to the indicated geographic areas (see NOTE 1). |
|  |  | locatorType | | Uri | 1..1 | The type of the members of the locators 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. |
|  |  | locators | | 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 locatorType. |
|  | urlSignature | | | object | 0..1 | Defines the URL signing scheme to be enforced by the Media AS at reference point M4 service locations (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. |
|  |  | urlPattern | | 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 a 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]. |
|  |  | tokenName | | 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. |
|  |  | passphraseName | | string | 1..1 | The name of the token parameter to be used to refer to the passphrase when constructing the M4 authentication token. |
|  |  | passphrase | | 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 distributionConfiguration.  (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.) |
|  |  | tokenExpiryName | | 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. |
|  |  | useIPAddress | | boolean | 1..1 | If set to true, the IP address of the Media Access Function is included in the computation of the authentication token for resources that match urlPattern and access to matching media resources shall be allowed by the Media AF only when the M4 request is made from this IP address. |
|  |  | ipAddressName | | string | 0..1 | The name of the token parameter that is encoded as part of the M4 authentication token if the useIPAddress flag is set to true.  (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]. | | | | | | |

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### 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 |
| --- | --- | --- | --- | --- | --- | --- |
| name | | | | string | 1..1 | A name for this Content Publishing Configuration. |
| contribution‌Configurations | | | | array(Contribution‌Configuration) | 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. |
|  | contributionId | | | 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 chosen by the Media AF when the Content Publishing Configuration is provisioned. It is an error for the Media Application Provider to set this. |
|  | affinityGroup | | | string | 0..1 | The Media Application Provider may assign an affinity group label indicating that reference point M4 service locations exposed by this contribution configuration are to be deployed with service locations exposed by other contribution configurations with the same affinity group label. Service locations exposed by contribution configurations with different affinity group labels are not intended to be deployed together.  If this property is omitted, deployment of service locations for this contribution configuration is at the discretion of the Media AF. |
|  | edgeResources‌ConfigurationId | | | 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. |
|  | content‌Preparation‌TemplateId | | | 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. |
|  | certificateId | | | 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. |
|  | canonical‌Domain‌Name | | | string | 1..1 | All resources exposed from service locations at reference point M4 shall be accessible through this default Fully-Qualified Domain Name assigned by the Media AF. |
|  | domainNameAlias | | | 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 at reference point M4 service locations.  This domain name is used by the Media AS to set appropriate CORS HTTP response headers at reference point M4 service locations.  If this property is present, the Media Application Provider is responsible for providing in the DNS a *CNAME* record that resolves domainNameAlias to canonicalDomainName.  If the certificateId property is also present in this contribution configuration, the provided domain name alias shall match one of the subjectAltName extension fields in the referenced Server Certificate resource, allowing for wildcard matching. |
|  | baseURL | | | 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 for this contribution configuration.  Nominated by the Media AF when the Content Publishing Configuration is provisioned. It is an error for the Media Application Provider to set this. |
|  | entryPoint | | | Relative‌Media‌Entry‌Point | 1..1 | The Media Entry Point nominated by the Media Application Provider for this contribution configuration (see clause 7.3.3.12). |
|  |  | relativePath | | 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. |
|  |  | contentType | | string | 1..1 | The MIME content type of this Media Entry Point.  This property shall be mutually exclusive with protocol.  Used by the Media Client to select a contribution configuration.  Nominated by the Media Application Provider. |
|  |  | protocol | | Uri | 1..1 | A fully-qualified term identifier URI that identifies the media contribution protocol at reference point M4 for this Media Entry Point.  This property shall be mutually exclusive with contentType.  Nominated by the Media Application Provider.  The controlled vocabulary of media contribution protocols is specified in clause 10 of TS 26.512 [6]. |
|  |  | profiles | | 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. |
| egestConfiguration | | | | Egest‌Configuration | 1..1 | Parameters for egesting media content from the Media AS at reference point M2. |
|  | mode | | | Content‌Transfer‌Mode | 1..1 | Indicates whether content is pulled from the Media AS by the Media Application Provider or pushed to the Media Application Provider by the Media AS (see clause 7.3.4.5).  Nominated by the Media Application Provider. |
|  | protocol | | | 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]. |
|  | baseURL | | | 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 for this publishing configuration.  In the case of pull-based content egest (modeis set to PULL), 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 a reference point M4 service location is mapped by the Media AS to a URL at reference point M2 whose base is the value of this property.  In the case of push-based content egest (modeis set to PUSH), this property shall be provided to the Media AF and indicates the base URL to which content for this Content Publishing Configuration is to be published. |
|  | entryPoint | | | Relative‌Media‌Entry‌Point | 0..1 | The Media Entry Point for content egest used by the Media Application Provider at reference point M2.  In the case of pull-based content egest (modeis set to PULL), this object shall be provided by the Media AF.  In the case of push-based content egest (modeis set to PUSH), this object may be provided by the Media Application Provider.  The semantics of the entry point are dependent on the value of the contentType property. |
|  |  | relativePath | | 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. |
|  |  | contentType | | string | 1..1 | The MIME content type of this Media Entry Point.  Nominated by the Media Application Provider. |
|  |  | protocol | | 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 contentType.  Nominated by the Media Application Provider.  The controlled vocabulary of media contribution protocols is specified in clause 10 of TS 26.512 [6]. |
|  |  | profiles | | 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. |
|  | cachingConfigurations | | | array(Caching‌Configuration) | 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 in relation to this Content Publishing Configuration. (See clause 7.3.3.13.)  Applicable only for pull-based content egest (modeis set to PULL). For Push-based egest (methodis set to PUSH), this property shall not be present.  If present, the array shall have at least one member. |
|  |  | urlPatternFilter | | 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]. |
|  |  | cachingDirectives | | object | 1..1 | If a urlPatternFilter applies to a resource, then the provided cachingDirectives shall be applied by the Media AS at reference point M2.  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. |
|  |  |  | statusCodeFilters | array(integer) | 0..1 | The set of Media AS response status codes at reference point M2 to which these cachingDirectives apply.  If the property is present, the array shall contain at least one item.  If absent, the enclosing cachingDirectives shall apply to all Media AS responses. |
|  |  |  | noCache | boolean | 0..1 | If set to *true*, 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.  Default value if omitted: false. |
|  |  |  | maxAge | 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 noCache is false, it also determines the time-to-live period signalled by the Media AS at reference point M2 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 noCache is false and if omitted, ingested media resources shall be cached indefinitely until the Content Publishing Configuration is destroyed by the Media Application Provider or until the available caching resources in the Media AS are exhausted, whichever is sooner. |

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

## ===== CHANGE =====

Annex E (normative):  
Content Preparation Template formats for 5GMS

# E.1 General

This annex specifies Content Preparation Templates used to specify manipulations applied by a 5GMS AS to downlink media resource ingested at reference point M2 for distribution at reference point M4, or to uplink media resources contributed at reference point M4 for egest at reference point M2.

# E.2 CMMF Content Preparation Templates

### E.2.1 General

Coded Multi-source Media Format (CMMF) as specified in ETSI TS 103 973 [52] is an extensible container format designed to facilitate the management and interchange of audio-visual media and metadata in one or more coded represenations (e.g., encoded with Application Layer Forward Error Correction, linear, network, or channel codes). The coded media representations supported by CMMF enable the efficient use of multi-source, multi-path, and multi-access connectivity for network-delivered applications.

Media resources ingested by a 5GMS AS at reference point M2/M10 or M4 for distribution at reference point M4 or M2 respectively may be further encoded and packaged as CMMF objects by the 5GMS AS. Likewise, CMMF objects ingested by a 5GMS AS at reference point M2/M10 or M4 may be decoded by the 5GMS AS prior to distribution at reference point M4 or M2 respectively. This clause defines Content Preparation Templates supported by the Content Preparation Templates Provisioning API specified in clause 8.5 for the creation and decoding of CMMF objects by the 5GMS AS.

- In the case of downlink media streaming, depending on the Content Hosting Configuration, the CMMF Encoder specified in clauses 4.2.1 and 4.3.3 of ETSI TS 103 973 [52] may be a single input, single output or a single input, multiple output process. A media resource (e.g., audio segment, video segment, etc.) made available to the 5GMSd AS at reference point M2d or M10d is ingested into the CMMF Encoder where it is encoded and packaged as one or more CMMF objects, and those objects are made available at service locations exposed by the 5GMSd AS at reference point M4d.

- In the case of uplink media streaming, depending on the Content Publishing Configuration, the CMMF Encoder specified in clauses 4.2.1 and 4.3.3 of ETSI TS 103 973 [52] may be a single input, single output or a single input, multiple output process. A media resource (e.g., audio segment, video segment, etc.) contributed to the 5GMSu AS at reference point M4u service locations is ingested into the CMMF Encoder where it is encoded and packaged as one or more CMMF objects, and those objects are made available at service locations exposed by the 5GMSu AS at reference point M2u. Likewise, the CMMF Decoder specified in clause ??? of ETSI TS 103 973 [52] may be a single input, single output or a multiple input, single output process. CMMF objects (e.g., CMMF encoded audio segments, video segments, etc.) contributed to the 5GMSu AS at one of more reference point M4u service locations is ingested into the CMMF Decoder where they are decoded, and the resulting source media resource is made available at service locations exposed by the 5GMSu AS at reference point M2u.

The following Content Preparation Templates configure a CMMF Encoder provisioned within a 5GMS AS.

### E.2.2 Content Preparation Template CPT-CMMF-A

The Content Preparation Template CPT-CMMF-A provides a generic method of provisioning CMMF content preparation that conforms to the CMMF profile described in clause ?? of TS 26.511 [53]. The data model of this Content Preparation Template is specified in clause E.2.2.1 and the formal syntax is specified in clause P.Q.R. Content Preparation Templates following this format shall be provisioned using the MIME media type specified in clause F.2.2.

#### E.2.2.1 Data model

Editor’s Note: The data model below is a work in progress.

Table E.2.2.1-1: CPT-CMMF-A Content Preparation Template Parameters

| Property name | | | JSON data type | Cardinality | Description |
| --- | --- | --- | --- | --- | --- |
| contentPreparation  TemplateId | | | string | 1..1 | Content Preparation Template identifier that uniquely identifies the Content Preparation Template for which this configuration belongs. |
| cmmfConfigurations | | | array(Cmmf‌Configuration) | 1..1 | Array containing CMMF configurations used to encode media resources. At least one must be defined. |
|  | sourceMediaPathPattern | | string | 1..1 | A required expression against which the path of the media resource URL shall be compared. If the path matches, this CMMF configuration applies. |
|  | subatomHeaderOptions | | object | 0..1 | Object containing options that apply to the CMMF subatom header as defined in clause 6.1.2 of ETSI TS 103 973 [52]. |
|  |  | includeBitstreamId | boolean | 0..1 | If true, the CMMF Encoder includes an identifier as specified in clause 6.1.2.4 of ETSI TS 103 973 [52]. Default value if omitted is true. |
|  | syncSubatomOptions | | object | 1..1 | Object containing options that apply to the CMMF sync subatom specified in clause 6.1.3 of ETSI TS 103 973 [52]. |
|  |  | cmmfVersion | integer | 1..1 | CMMF bitstream version number as specified in clause 6.1.3.2 of ETSI TS 103 973 [52]. |
|  |  | include‌Content‌Encode‌Uuid | boolean | 0..1 | A UUID is generated that identifies a specific encode of a piece of content as specified in clause 6.1.3.4 of ETSI TS 103 973 [52]. |
|  | bitstreamHeaderOptions | | object | 0..1 | Object containing options that apply to the CMMF bitstream\_header subatom specified in clause 6.1.4 of ETSI TS 103 973 [52]. |
|  |  | codeType | integer | 0..1 | Code type as defined in table 40 of ETSI TS 103 973 [52]. If omitted, the default code type is 1 (Raptor as defined in IETF RFC 5053 [54]. |
|  |  | profileType | string | 0..1 | Profile type describing the entity defining the CMMF profile in use as specified in clause 6.1.4.11 of ETSI TS 103 973 [52] and clause ?? of TS 26.511 [53]. |
|  |  | profileDescription | string | 0..1 | Profile description identifying the profile CMMF objects conform to, as specified in clause 6.1.4.12 of ETSI TS 103 973 [52] and clause ?? of TS 26.511 [53]. A profile may impose constraints on the code type used, the number of blocks, the number of symbols or other encoding parameters. |
|  |  | bitstream‌Encryption‌Info‌Url | string | 0..1 | URL to a Key Management Server that provides key management and encryption parameters for encrypted CMMF objects as specified in clause 7.3 of ETSI TS 103 973 [52]. |

## ===== CHANGE =====

Annex F (normative):  
IANA registration

# F.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>.

# F.2 Registration of MIME media types for Content Preparation Templates

## F.2.1 General

This clause provides the formal registrations of MIME media types for Content Preparation Template formats specified in annex E.

## F.2.2 Registration of MIME media type "application/…"CMMF Content Preparation Template

Editor’s Note: To be defined.