**3GPP TSG-SA4 Meeting #117-e**S4-220075

**14th – 22nd February 2022**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | 26.512 | **CR** | **0015** | **rev** | **1** | **Current version:** |  |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | dCR on Edge Provisioning for Media Services | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Incoroporated | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5GMS\_EDGE\_3 | | | | |  | ***Date:*** | | | 8th February 2022 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This CR introduces extensions to the 5GMS provisioning procedures to add support for provisioning edge resources for media services. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | A new API on the provisioning of edge resources and the corresponding REST resource definitions are added. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | 5G media sessions will not be able to make use of edge resources. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 3.3, 4.2, 5.2, 6.4.3.8, 6.4.3.9, 6.4.4.4, 6.4.4.5, 7.10, D-1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

|  |
| --- |
| 1st Change |

# 2 References

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

…

[42] 3GPP TS 24.558: "Enabling Edge Applications; Protocol specification".

[43] 3GPP TS 29.558: "Enabling Edge Applications; Application Programming Interface (API) specification; Stage 3".

|  |
| --- |
| 2nd Change |

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP 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 3GPP TR 21.905 [1].

…

BMFF (ISO) Base Media File Format

ABR Adaptive Bit Rate

ACR Application Context Relocation

AF Application Function

…

DNS Domain Name Server

EAS Edge Application Server

ECGI E-UTRAN Cell Global Identifier

ECMA European Computer Manufacturers Association

…

EES Edge Enabler Server

|  |
| --- |
| 3rd Change |

## 4.2 APIs relevant to Downlink Media Streaming

Table 4.2‑1 summarises the APIs used to provision and use the various downlink media streaming features specified in TS 26.501 [2].

Table 4.2‑1: Summary of APIs relevant to downlink media streaming features

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 5GMSd feature | Abstract | Relevant APIs | | |
| Interface | API name | Clause |
| Content protocols discovery | Used by the 5GMSd Application Provider to interrogate which content ingest protocols are supported by 5GMSd AS(s). | M1d | Content Protocols Discovery API | 7.5 |
| Content hosting | Content is ingested, hosted and distributed by the 5GMSd AS according to a Content Hosting Configuration associated with a Provisioning Session. | M1d | Provisioning Sessions API | 7.2 |
| Server Certificates Provisioning API | 7.3 |
| Content Preparation Templates Provisioning API | 7.4 |
| Content Hosting Provisioning API | 7.6 |
| M2d | HTTP-pull based content ingest protocol | 8.2 |
| DASH-IF push based content ingest protocol | 8.3 |
| M4d | DASH [4] or 3GP [37] | 10 |
| M5d | Service Access Information API | 11.2 |
| Metrics reporting | The 5GMSd Client uploads metrics reports to the 5GMSd AF according to a provisioned Metrics Reporting Configuration it obtains from the Service Access Information for its Provisioning Session. | M1d | Provisioning Sessions API | 7.2 |
| Metrics Reporting Provisioning API | 7.8 |
| M5d | Service Access Information API | 11.2 |
| Metrics Reporting API | 11.4 |
| Consumption reporting | The 5GMSd Client provides feedback reports on currently consumed content according to a provisioned Consumption Reporting Configuration it obtains from the Service Access Information for its Provisioning Session. | M1d | Provisioning Sessions API | 7.2 |
| Consumption Reporting Provisioning API | 7.7 |
| M5d | Service Access Information API | 11.2 |
| Consumption Reporting API | 11.3 |
| Dynamic Policy invocation | The 5GMSd Client activates different traffic treatment policies selected from a set of Policy Templates configured in its Provisioning Session. | M1d | Provisioning Sessions API | 7.2 |
| Policy Templates Provisioning API | 7.9 |
| M5d | Service Access Information API | 11.2 |
| Dynamic Policies API | 11.5 |
| Network Assistance | The 5GMSd Client requests bit rate recommendations and delivery boosts from the 5GMSd AF. | M5d | Service Access Information API | 11.2 |
| Network Assistance API | 11.6 |
| Edge  resources | Edge resources are provisioned for 5GMS media sessions. | M1d | Edge Resource Provisioning API | 7.10 |
| M5d | Service Access Information API | 11.2 |

|  |
| --- |
| 4th Change |

## 5.2 APIs relevant to Uplink Media Streaming

Table 5.2‑1 summarises the APIs used to provision and use the various uplink media streaming features specified in TS 26.501 [2].

Table 5.2‑1: Summary of APIs relevant to uplink media streaming features

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 5GMSu feature | Abstract | Relevant APIs | | |
| Interface | API name | Clause |
| Content protocols discovery | Used by the 5GMSu Application Provider to query which content egest protocols are supported by 5GMSu AS(s). | M1u | Content Protocols Discovery API | 7.5 |
| Content preparation | Supports manipulation by the 5GMSu AS of streaming media content uploaded by 5GMSu Client over M4u, prior to egest of the manipulated content over M2u. | M1u | Content Preparation Templates Provisioning API | 7.4 |
| Metrics reporting | The 5GMSu Client uploads metrics reports to the 5GMSu AF according to a provisioned Metrics Reporting Configuration it obtains from the Service Access Information for its Provisioning Session. | M1u | Provisioning Sessions API | 7.2 |
| Metrics Reporting Provisioning API | 7.8 |
| M5u | Service Access Information API | 11.2 |
| Metrics Reporting API | 11.4 |
| Dynamic Policy invocation | The 5GMSu Client activates different traffic treatment policies selected from a set of Policy Templates configured in its Provisioning Session. | M1u | Provisioning Sessions API | 7.2 |
| Policy Templates Provisioning API | 7.9 |
| M5u | Service Access Information API | 11.2 |
| Dynamic Policies API | 11.5 |
| Network Assistance | The 5GMSu Client requests bit rate recommendations and delivery boosts from the 5GMSu AF. | M5u | Service Access Information API | 11.2 |
| Network Assistance API | 11.6 |
| Edge  resources | Edge resources are provisioned for 5GMS media sessions. | M1u | Edge Resource Provisioning API | 7.10 |
| M5u | Service Access Information API | 11.2 |

|  |
| --- |
| 5th Change |

#### 6.4.3.8 EdgeProcessingEligibilityCriteria type

The EdgeProcessingEligibilityCriteria type is specified in table 6.4.3.8-1 below:

Table 6.4.3.8-1: Definition of EdgeProcessingEligibilityCriteria type

| Property name | Type | Cardinality | Description |
| --- | --- | --- | --- |
| service‌DataFlow‌Descriptions | array(Service‌DataFlow‌Description) | 1..1 | A set of service data 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 on any service data flow.  Valid ServiceDataFlowDescription elements:  - domainName  - flowDescription.dstIp and flowDescription.dstPort  - flowDescription.toSTc  - flowDescription.flowLabel  Other ServiceDataFlowDescription settings shall be rejected by the 5GMS AF. |
| ueLocations | array(Location‌Area5G) | 1..1 | A set of geographical areas in which edge media processing is to be triggered when a UE is present.  If the set is empty, edge media processing may be invoked for an otherwise eligible media stream in any location. |
| timeWindow | array(TimeWindow) | 1..1 | Edge media processing is triggered when the session is taking place during one of the indicated time windows.  If the set is empty, edge media processing may be invoked for an otherwise eligible media stream at any time. |
| appRequest | boolean | 1..1 | When set TRUE, 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 re-selection are for future study.  NOTE 2: Data types LocationArea5G and TimeWindow are defined in TS 24.558 [42]. | | | |

|  |
| --- |
| 6th Change |

#### 6.4.4.4 EASRelocationTolerance enumeration

The EASERelocationTolerance enumeration is specified in table 6.4.4.4-1 below:

Table 6.4.4.4‑1: Definition of EASRelocationTolerance enumeration

|  |  |
| --- | --- |
| Enumeration value | Description |
| RELOCATION\_UNAWARE | The application is not aware of any EAS relocation that may happen. Relocation procedures may be executed without any restrictions. |
| RELOCATION\_TOLERANT | The application may tolerate EAS relocation, but requirements for the relocation procedure must be met. An application context may need to be transferred. |
| RELOCATION\_INTOLERANT | The application does not tolerate relocation. |

|  |
| --- |
| 7th Change |

## 7.10 Edge Resources Provisioning API

### 7.10.1 General

The Edge Resources Provisioning API is used by the 5GMS 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 5GMS AS EAS instance that will serve the media session to the UE.

### 7.10.2 Resource structure

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

{apiRoot}/3gpp-m1/{apiVersion}/provisioning-sessions/{provisioningSessionId}/

Table 7.10.2-1 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 7.10.2-1: Operations supported by the Edge Resources API

|  |  |  |  |
| --- | --- | --- | --- |
| Operation | 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.  If the operation succeeds, the URL of the newly created Edge Resources Configuration resource shall be returned in the Location header of the response. |
| Retrieve Edge Resources Configuration | edge-resources-configurations/‌{edgeResourcesConfigurationId} | GET | Used to retrieve a specific Edge Resources Configuration resource. |
| Modify Edge Resources Configuration | PUT, PATCH | Used to modify or replace an existing Edge Resources Configuration resource. |
| Destroy Edge Resources Configuration | DELETE | Used to destroy an existing Edge Resources Configuration resource. |

### 7.10.3 Data model

#### 7.10.3.1 EdgeResourcesConfiguration resource type

The data model for the Edge Resources Configuration resource is specified in table 7.10.3.1-1:

Table 7.10.3.1-1: Definition of EdgeResourcesConfiguration resource type

| Property name | Type | Cardinality | Description |
| --- | --- | --- | --- |
| edgeResourcesConfigurationId | ResourceId | 1..1 | An identifier for this Edge Resources Configuration that is unique within the scope of the enclosing Provisioning Session. |
| edgeManagementMode | Edge‌Management‌Mode | 1..1 | Indicates whether the management of edge resources is application-driven or network-driven. (See clause 7.10.3.2.) |
| eligibilityCriteria | Edge‌Processing‌Eligibility‌Criteria‌ | 0..1 | Condition to activate edge resources for this Provisioning Session. If the activationTrigger element is not provided, it shall be assumed that all media sessions related to the parent Provisioning Session will use edge resources. (See clause 6.4.3.8.) |
| easRequirements | EASRequirements | 1..1 | Requirements on the EAS Profile used by the 5GMS AF or by the EEC to discover and select one or more 5GMS EAS instances to serve media streaming sessions. (See clause 7.10.3.3.) |
| eas‌Relocation‌Requirements | array(M1EAS‌Relocation‌Requirements) | 0..1 | EAS relocation tolerance and requirements.  If not present, the 5GMS AF shall assume that the application is unaware of context transfer and that transfers to a target 5GMS EAS are allowed. (See clause 7.10.3.4.) |

#### 7.10.3.2 EdgeManagementMode enumeration

The EdgeManagementMode enumeration is specified in table 7.10.3.2-1 below:

Table 7.10.3.2‑1: Definition of EdgeManagementMode enumeration

|  |  |
| --- | --- |
| Enumeration value | Description |
| EM\_NETWORK\_DRIVEN | The 5GMS AF, in coordination with the Media Session Handler, assigns edge resources and directs application traffic to the 5GMS EAS instance transparently to the application running on the UE. |
| EM\_APP\_DRIVEN | An Application Client running on the UE explicitly manages edge resources via the EES at reference point EDGE‑1. |

#### 7.10.3.3 EASRequirements type

The EASRequirements type is specified in table 7.10.3.3-1 below:

Table 7.10.3.3-1: Definition of EASRequirements type

|  |  |  |  |
| --- | --- | --- | --- |
| Property name | Type | Cardinality | Description |
| easProviderIds | array(string) | 1..1 | The set of acceptable providers of 5GMS EAS instances associated with this Provisioning Session.  If empty, any EAS instances from any provider are acceptable. |
| easType | string | 1..1 | The type of 5GMS EAS instances associated with this Provisioning Session. |
| easFeatures | array(string) | 1..1 | 5GMS AS service features required to be supported by EAS instances associated with this Provisioning Session.  If empty, 5GMS EAS instances of the specified easType with any feature set are acceptable. |
| serviceKpi | EASServiceKPI | 0..1 | Service characteristics required to be satisfied by 5GMS AS EAS instances associated with this Provisioning Session.  If absent, 5GMS EAS instances with any service characteristics are acceptable. |
| serviceArea | Geographical‌Service‌Area | 0..1 | The list of geographical areas that 5GMS EAS instances associated with this Provisioning Session are required to serve.  If absent, 5GMS EAS instances serving any geographical area are acceptable. |
| service‌Availability‌Schedule | array(Scheduled‌Communication‌Time) | 1..1 | The required availability schedule for 5GMS EAS instances associated with this Provisioning Session.  If empty, 5GMS EAS instances are required to be available at all times. |
| service‌Continuity‌Scenarios | array(ACRScenario) | 1..1 | The Application Context Relocation scenarios that 5GMS EAS instances associated with this Provisioning Session are required to support for service continuity.  If empty 5GMS EAS instances are not required to support service continuity across EAS relocation. |
| NOTE: Data types ScheduledCommunicationTime, GeographicalServiceArea, EASServiceKPI, and ACRScenario are defined in TS 29.558 [43]. | | | |

#### 7.10.3.4 M1EASRelocationRequirements type

The M1ACRRequirements type is specified in table 7.10.3.4-1 below:

Table 7.10.3.4-1: Definition of M1EASRelocationRequirements type

| Property name | Type | Cardinality | Description |
| --- | --- | --- | --- |
| tolerance | EAS‌Relocation‌Tolerance | 1..1 | Indicates whether the 5GMS EAS instance tolerates Application Context Relocation. (See clause 6.4.4.4.)  If set to RELOCATION\_INTOLERANT, the other properties in this data type shall be ignored. |
| max‌Interruption‌Duration | 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 5GMS EAS instance shall not be performed. |
| maxResponseTime‌Difference | UintegerRm | 0..1 | The maximum allowed difference between the previously experienced average User Plane network latency to the source 5GMS EAS instance and the expected latency to the target 5GMS EAS instance, expressed in milliseconds. |

|  |
| --- |
| 8th Change |

Table D-1: Index of Provisioning (M1) APIs

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| HTTP request path element hierarchy | Description | Allowed HTTP methods | | | | | Resource | OpenAPI |
| Create | Retrieve | Update | Destroy | Non-RESTful operation | structure definition clause | definition clause |
| provisioning-sessions | Provisioning Sessions collection | POST |  |  |  |  | 7.2.2 | C.3.1 |
| {provisioningSessionId} | Provisioning Session resource |  | GET |  | DELETE |  |
| certificates | Server Certificates collection | POST |  |  |  |  | 7.3.2 | C.3.2 |
| {certificateId} | Server Certificate resource |  | GET | PUT | DELETE |  |
| content-preparation-templates | Content Preparation Templates collection | POST |  |  |  |  | 7.4.2 | C.3.3 |
| {contentPreparationTemplateId} | Content Preparation Template resource |  | GET | PUT, PATCH | DELETE |  |
| content-protocols-discovery | Content Protocols resource |  | GET |  |  |  | 7.5.2 | C.3.4 |
| content-hosting-configuration | Content Hosting Configuration resource | POST | GET | PUT, PATCH | DELETE |  | 7.6.2 | C.3.5 |
| purge | Content Hosting cache purge operation |  |  |  |  | POST |
| consumption-reporting-configuration | Consumption Reporting Configuration resource | POST | GET | PUT, PATCH | DELETE |  | 7.7.2 | C.3.6 |
| metrics-reporting-configuration | Metrics Reporting Configuration collection | POST |  |  |  |  | 7.8.2 | C.3.7 |
| {metricsReportingConfigurationId} | Metrics Reporting Configuration resource |  | GET | PUT, PATCH | DELETE |  |
| policy-templates | Policy Templates collection | POST |  |  |  |  | 7.9.2 | C.3.8 |
| {policyTemplateId} | Policy Template resource |  | GET | PUT, PATCH | DELETE |  |
| edge-resources-configurations | Edge Resources Configurations collection | POST |  |  |  |  | 7.10.2 | C.3.9 |
| {edgeResourcesConfigurationId} | Edge Resources Configuration resource |  | GET | PUT, PATCH | DELETE |  |

|  |
| --- |
| End of Changes |