**3GPP TSG-CT WG3 Meeting #128 *C3-232166r2***

**Bratislava, Slovakia, 22nd May – 26th May 2023**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **29.520** | **CR** | **0720** | **rev** | **-** | **Current version:** | **18.1.0** |  |
|  | | | | | | | | |
| *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 |  | Radio Access Network |  | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Update to Nnwdaf\_MLModelProvision API for Supportting ML Model Retrieval with ADRF | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | , Nokia, Nokia Shanghai Bell | | | | | | | | | |
| ***Source to TSG:*** | CT3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | eNA\_Ph3 | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | According to the approved stage2 CR #0729 (S2-2306093) in SA2#156e, the "ADRF (Set) ID" may be provided by the NWDAF containing MTLF to the consumer of the ML model provisioning service. And a "Storage Transaction ID" may also be provisioned when "ADRF (Set) ID" is provided.  This CR proposes to make the following changes to update the Nnwdaf\_MLModelProvision API for supportting ML model retrieval with ADRF:   * Update the "MLEventNotif" data type. * Define a new data type "MLModelAdrf". * Introduce "adrfId", "adrfSetId" and "storTransId" attributes for the "ADRF (Set) ID" and "Storage Transaction ID" to the Nnwdaf\_MLModelProvision\_Notify request message. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The following changes are made:   * Updated the description in clause 4.5.2.4.2. * Updated the "MLEventNotif" data type in clause 5.4.6.2.6. * Defined a new data type "MLModelAdrf" in clause 5.4.6.2.9. * Introduced "adrfId", "adrfSetId" and "storTransId" attributes for the "ADRF (Set) ID" and "Storage Transaction ID" to the Nnwdaf\_MLModelProvision\_Notify request message in clause 5.4.6.2.9. * Updated the OpenAPI file in A.5. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Misalignment with stage 2, no support of "ADRF (Set) ID" and "Storage Transaction ID" in the Nnwdaf\_MLModelProvision\_Notify request message may cause implement errors. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.5.2.4.2, 5.4.6.1, 5.4.6.2.6, 5.4.6.2.9 (new), A.5 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 23.288 CR 0729 | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | This CR introduces backward compatible feature to the Nnwdaf\_MLModelProvision service API. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**Additional discussion(if needed):**

**Proposed changes:**

\*\*\* 1st Change \*\*\*

##### 4.5.2.4.2 Notification about subscribed event

Figure 4.5.2.4.2-1 shows a scenario where the NWDAF sends a request to the NF Service Consumer to notify for event notifications (see also 3GPP TS 23.288 [17]).



Figure 4.5.2.4.2-1: NWDAF notifies the subscribed event

The NWDAF shall invoke the Nnwdaf\_MLModelProvision\_Notify service operation to notify the subscribed event. The NWDAF shall send an HTTP POST request with "{notifUri}" received in the Nnwdaf\_MLModelProvision\_Subscribe service operation as Resource URI, as shown in figure 4.2.2.4.2-1, step 1. The NwdafMLModelProvNotif data structure provided in the request body that shall include:

- an event subscriptionId as "subscriptionId" attribute;

- and description of the notified event as "eventNotifs" attribute, that for each event, the MLEventNotif data type shall include an event identifier as the "event" attribute, an address (e.g. a URL or an FQDN) of the ML model file as the "mLFileAddr" attribute or (if the "ModelProvisionExt"feature is supported) ADRF ID as the "adrfId" attribute or ADRF Set ID as the "adrfSetId" attribute, and may include a notification correlation identifier as "notifCorreId" attribute and a time period when the provided ML model applies as the "validityPeriod" attribute and an area where the provided ML model applies as the "spatialValidity" attribute and (if the "ModelProvisionExt"feature is supported) Storage Transaction ID when the ADRF (Set) ID (i.e. "adrfId" or "adrfSetId" attribute) is provided as the "storTransId" attribute.

Upon the reception of an HTTP POST request, if the NF service consumer successfully processed and accepted the received HTTP POST request, the NF Service Consumer shall store the notification and respond with HTTP "204 No Content" status code.

If the NF service consumer receives the ADRF ID as the "adrfId" attribute or the ADRF Set ID as the "adrfSetId" attribute in the NwdafMLModelProvNotif data structure of the HTTP POST request, it may invoke Nadrf\_MLModelManagement\_RetrievalRequest service operation to retrieve ML Model from the ADRF (Set) as specified in 3GPP TS 29.575 [27].

If the NF service consumer determines the received HTTP POST request needs to be redirected, the NF service consumer shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [6].

If errors occur when processing the HTTP POST request, the NWDAF shall send an HTTP error response as specified in clause 5.4.7.

\*\*\* 2nd Change \*\*\*

#### 5.4.6.1 General

This clause specifies the application data model supported by the API.

Table 5.4.6.1-1 specifies the data types defined for the Nnwdaf\_MLModelProvision service based interface protocol.

Table 5.4.6.1-1: Nnwdaf\_MLModelProvision specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Section defined | Description | Applicability |
| FailureEventInfoForMLModel | 5.4.6.2.7 |  |  |
| MLEventNotif | 5.4.6.2.6 |  |  |
| MLEventSubscription | 5.4.6.2.3 |  |  |
| MLModelAddr | 5.4.6.2.8 |  |  |
| MLModelAdrf | 5.4.6.2.9 | Represents the ADRF (Set) information of ML Model. | ModelProvisionExt |
| NwdafMLModelProvNotif | 5.4.6.2.5 |  |  |
| NwdafMLModelProvSubsc | 5.4.6.2.2 |  |  |

Table 5.4.6.1-2 specifies data types re-used by the Nnwdaf\_MLModelProvision service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nnwdaf\_MLModelProvision service based interface.

Table 5.4.6.1-2: Nnwdaf\_MLModelProvision re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| DateTime | 3GPP TS 29.571 [8] | Identifies the time. |  |
| EventFilter | 5.2.6.2.3 | Identifies the filter for the subscribed event. |  |
| NetworkAreaInfo | 3GPP TS 29.554 [18] | Identifies the network area. |  |
| NfInstanceId | 3GPP TS 29.571 [8] | Identifies an NF instance. | ModelProvisionExt |
| NfSetId | 3GPP TS 29.571 [8] | Identifies an NF Set instance. | ModelProvisionExt |
| NwdafEvent | 5.1.6.3.4 |  |  |
| RedirectResponse | 3GPP TS 29.571 [8] |  |  |
| ReportingInformation | 3GPP TS 29.523 [20] | Represents the requirements of reporting the subscription. |  |
| SupportedFeatures | 3GPP TS 29.571 [8] |  |  |
| TargetUeInformation | 5.1.6.2.8 |  |  |
| TimeWindow | 3GPP TS 29.122 [19] |  |  |
| Uri | 3GPP TS 29.571 [8] |  |  |

\*\*\* 3rd Change \*\*\*

##### 5.4.6.2.6 Type MLEventNotif

Table 5.4.6.2.6-1: Definition of type MLEventNotif

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| event | NwdafEvent | M | 1 | Identifies the subscribed event. |  |
| notifCorreId | string | O | 0..1 | Notification correlation ID used to identify the subscription to which the notification relates. It shall be set to the same value as the "notifCorreId" attribute of NwdafMLModelProvSubsc data type. |  |
| mLFileAddr | MLModelAddr | M | 1 | Indicates the address (e.g. a URL or an FQDN) of the ML model file. |  |
| mLModelAdrf | MLModelAdrf | O | 0..1 | Indicates the ADRF (Set) information of the ML Model. | ModelProvisionExt |
| validityPeriod | TimeWindow | O | 0..1 | Indicates the time period when the provided ML model applies. |  |
| spatialValidity | NetworkAreaInfo | O | 0..1 | Indicates the area where the provided ML model applies. |  |

\*\*\* 4th Change (new) \*\*\*

##### 5.4.6.2.9 Type MLModelAdrf

Table 5.4.6.2.9-1: Definition of type MLModelAdrf

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| adrfId | NfInstanceId | C | 0..1 | Identifier of the ADRF.  (NOTE) |  |
| adrfSetId | NfSetId | C | 0..1 | Identifier of the ADRF Set.  (NOTE) |  |
| storTransId | string | O | 0..1 | Indicates Storage Transaction ID, may be provided when "adrfId" or "adrfSetId" attribute is provisioned. |  |
| NOTE: One of "adrfId" and "adrfSetId" attributes shall be provided. | | | | | |

\*\*\* 5th Change \*\*\*

# A.5 Nnwdaf\_MLModelProvision API

openapi: 3.0.0

info:

title: Nnwdaf\_MLModelProvision

version: 1.1.0-alpha.2

description: |

Nnwdaf\_MLModelProvision API Service.

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externalDocs:

description: 3GPP TS 29.520 V18.1.0; 5G System; Network Data Analytics Services.

url: https://www.3gpp.org/ftp/Specs/archive/29\_series/29.520/

servers:

- url: '{apiRoot}/nnwdaf-mlmodelprovision/v1'

variables:

apiRoot:

default: https://example.com

description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

security:

- {}

- oAuth2ClientCredentials:

- nnwdaf-mlmodelprovision

paths:

/subscriptions:

post:

summary: Create a new Individual NWDAF ML Model Provision Subscription resource.

operationId: CreateNWDAFMLModelProvisionSubcription

tags:

- Subscriptions (Collection)

requestBody:

required: true

content:

application/json:

schema:

$ref: '#/components/schemas/NwdafMLModelProvSubsc'

responses:

'201':

description: Create a new Individual NWDAF ML Model Provision Subscription resource.

content:

application/json:

schema:

$ref: '#/components/schemas/NwdafMLModelProvSubsc'

headers:

Location:

description: >

Contains the URI of the newly created resource, according to the structure

{apiRoot}/nnwdaf-mlmodelprovision/v1/subscriptions/{subscriptionId}.

required: true

schema:

type: string

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

callbacks:

myNotification:

'{$request.body#/notifUri}':

post:

requestBody:

required: true

content:

application/json:

schema:

type: array

items:

$ref: '#/components/schemas/NwdafMLModelProvNotif'

minItems: 1

responses:

'204':

description: No Content, Notification was succesfull

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

/subscriptions/{subscriptionId}:

put:

summary: update an existing Individual NWDAF ML Model Provision Subscription

operationId: UpdateNWDAFMLModelProvisionSubcription

tags:

- Individual NWDAF ML Model Provision Subscription (Document)

requestBody:

required: true

content:

application/json:

schema:

$ref: '#/components/schemas/NwdafMLModelProvSubsc'

parameters:

- name: subscriptionId

in: path

description: String identifying a subscription to the Nnwdaf\_MLModelProvision Service.

required: true

schema:

type: string

responses:

'200':

description: >

The Individual NWDAF ML Model Provision Subscription resource was modified successfully

and a representation of that resource is returned.

content:

application/json:

schema:

$ref: '#/components/schemas/NwdafMLModelProvSubsc'

'204':

description: >

The Individual NWDAF ML Model Provision Subscription resource was modified successfully.

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

delete:

summary: Delete an existing Individual NWDAF ML Model Provision Subscription.

operationId: DeleteNWDAFMLModelProvisionSubcription

tags:

- Individual NWDAF ML Model Provision Subscription (Document)

parameters:

- name: subscriptionId

in: path

description: String identifying a subscription to the Nnwdaf\_MLModelProvision Service.

required: true

schema:

type: string

responses:

'204':

description: >

No Content. The Individual NWDAF ML Model Provision Subscription matching the

subscriptionId was deleted.

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'502':

$ref: 'TS29571\_CommonData.yaml#/components/responses/502'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

$ref: 'TS29571\_CommonData.yaml#/components/responses/default'

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{nrfApiRoot}/oauth2/token'

scopes:

nnwdaf-mlmodelprovision: Access to the Nnwdaf\_MLModelProvision API

schemas:

NwdafMLModelProvSubsc:

description: Represents NWDAF Event Subscription resources.

type: object

properties:

mLEventSubscs:

type: array

items:

$ref: '#/components/schemas/MLEventSubscription'

minItems: 1

description: Subscribed events

notifUri:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uri'

mLEventNotifs:

type: array

items:

$ref: '#/components/schemas/MLEventNotif'

minItems: 1

description: >

Notifications about Individual Events.Shall only be present if the immediate reporting

indication in the "immRep" attribute within the "eventReq" attribute sets to true in the

event subscription, and the reports are available.

suppFeats:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/SupportedFeatures'

notifCorreId:

type: string

eventReq:

$ref: 'TS29523\_Npcf\_EventExposure.yaml#/components/schemas/ReportingInformation'

failEventReports:

type: array

items:

$ref: '#/components/schemas/FailureEventInfoForMLModel'

minItems: 1

description: >

Supplied by the NWDAF containing MTLF when available, shall contain the event(s) that

the subscription is not successful including the failure reason(s).

required:

- mLEventSubscs

- notifUri

MLEventSubscription:

description: Represents a subscription to a single event.

type: object

properties:

mLEvent:

$ref: 'TS29520\_Nnwdaf\_EventsSubscription.yaml#/components/schemas/NwdafEvent'

mLEventFilter:

$ref: 'TS29520\_Nnwdaf\_AnalyticsInfo.yaml#/components/schemas/EventFilter'

tgtUe:

$ref: 'TS29520\_Nnwdaf\_EventsSubscription.yaml#/components/schemas/TargetUeInformation'

mLTargetPeriod:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/TimeWindow'

expiryTime:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

required:

- mLEvent

- mLEventFilter

NwdafMLModelProvNotif:

description: Represents notifications on events that occurred.

type: object

properties:

eventNotifs:

type: array

items:

$ref: '#/components/schemas/MLEventNotif'

minItems: 1

description: Notifications about Individual Events.

subscriptionId:

type: string

description: String identifying a subscription to the Nnwdaf\_MLModelProvision Service.

required:

- eventNotifs

- subscriptionId

MLEventNotif:

description: Represents a notification related to a single event that occurred.

type: object

properties:

event:

$ref: 'TS29520\_Nnwdaf\_EventsSubscription.yaml#/components/schemas/NwdafEvent'

notifCorreId:

type: string

mLFileAddr:

$ref: '#/components/schemas/MLModelAddr'

mLModelAdrf:

$ref: '#/components/schemas/MLModelAdrf'

validityPeriod:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/TimeWindow'

spatialValidity:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

required:

- event

- mLFileAddr

FailureEventInfoForMLModel:

description: >

Represents the event(s) that the subscription is not successful including the failure

reason(s).

type: object

properties:

event:

$ref: 'TS29520\_Nnwdaf\_EventsSubscription.yaml#/components/schemas/NwdafEvent'

failureCode:

$ref: '#/components/schemas/FailureCode'

required:

- event

- failureCode

MLModelAddr:

description: Addresses of ML model files.

type: object

properties:

mLModelUrl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uri'

mlFileFqdn:

type: string

description: The FQDN of the ML Model file.

oneOf:

- required: [mLModelUrl]

- required: [mlFileFqdn]

MLModelAdrf:

description: ADRF (Set) information of the ML Model.

type: object

properties:

adrfId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/NfInstanceId'

adrfSetId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/NfSetId'

storTransId:

type: string

description: String identifying a Storage Transaction ID.

oneOf:

- required: [adrfId]

- required: [adrfSetId]

#

# ENUMERATIONS DATA TYPES

#

FailureCode:

anyOf:

- type: string

enum:

- UNAVAILABLE\_ML\_MODEL

- type: string

description: >

This string provides forward-compatibility with future extensions to the enumeration but

is not used to encode content defined in the present version of this API.

description: |

Represents the failure code.

Possible values are:

- UNAVAILABLE\_ML\_MODEL: Indicates the requested ML model for the event is unavailable.

\*\*\* End of Changes \*\*\*