**3GPP TSG-CT WG3 Meeting #134 *C3-242179r2***

**Changsha, China, 15-19 April 2024**

|  |
| --- |
| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **29.520** | **CR** | **0885** | **rev** | **1** | **Current version:** | **18.5.0** |  |
|  |
| *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:***  | MLModel Training Notification correction |
|  |  |
| ***Source to WG:*** | ZTE |
| ***Source to TSG:*** | CT3 |
|  |  |
| ***Work item code:*** | eNA\_Ph3 |  | ***Date:*** | 2024-04-08 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** |  Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | notifUri is contained not only in NwdafMLModelTrainSubsc data type, but also in NwdafMLModelTrainSubscPatch data type, however the latter one is not mentioned in the description of callback URI in the Table 5.5.5.2.2-1.The Nnwdaf\_MLModelTraining\_Notify request includes an array of NwdafMLModelTrainNotif, and NwdafMLModelTrainNotif includes an array of MLEventNotif. As the MLEventNotif data type contains the modle info for each analytics event, including a single NwdafMLModelTrainNotif in the notification is enough. Furthermore, it’s not indicated in the corresponding notification procedure that the POST request includes a list of NwdafMLModelTrainNotif data type. |
|  |  |
| ***Summary of change:*** | Table 5.5.5.2.2-1 is updated to cover NwdafMLModelTrainSubscPatch data type.Change array of NwdafMLModelTrainNotif to single in Nnwdaf\_MLModelTraining\_Notify.Change array of NwdafMLModelTrainNotif to single in NwdafMLModelTrainSubsc for immediate reporting. |
|  |  |
| ***Consequences if not approved:*** | Incomplele description of notifUri. Not proper data type definition. |
|  |  |
| ***Clauses affected:*** | 4.6.2.2.2, 4.6.2.2.3, 4.6.2.2.4, 5.5.5.2.2, 5.5.6.2.2, A.6 |
|  |  |
|  | **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 introduces a backwards compatible correction to the OpenAPI file of the Nnwdaf\_MLModelTraining API. |
|  |  |
| ***This CR's revision history:*** |  |

**Additional discussion(if needed):**

**Proposed changes:**

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

##### 4.6.2.2.2 Subscription for event notifications

Figure 4.6.2.2.2-1 shows a scenario where the NF service consumer sends a request to the NWDAF to subscribe for event notification(s) (as shown in 3GPP TS 23.288 [17]).



Figure 4.6.2.2.2-1: NF service consumer subscribes to notifications

The NF service consumer shall invoke the Nnwdaf\_MLModelTraining\_Subscribe service operation to subscribe to event notification(s). The NF service consumer shall send an HTTP POST request with "{apiRoot}/nnwdaf-mlmodeltraining/<apiVersion>/subscriptions" as Resource URI representing the "NWDAF ML Model Training Subscriptions", as shown in figure 4.6.2.2.2-1, step 1, to create a subscription for an "Individual NWDAF ML Model Training Subscription" according to the information in message body.

The NwdafMLModelTrainSubsc data structure provided in the request body shall include:

- an URI where to receive the requested notifications as the "notifUri" attribute;

- a description of the subscribed events as the "mLEventSubscs" attribute that, for each event, the MLEventSubscription data type shall include:

1) an event identifier as the "mLEvent" attribute;

2) event filter information as the "mLEventFilter" attribute; and

3) the ML Model Interoperability Information as the "modelInterInfo" attribute;

- a notification correlation identifier assigned by the NF service consumer for the requested notifications as "notifCorreId" attribute;

and may include:

- an identification of UE information for which data for ML model training is requested as the "tgtRepUe" attribute;

- the ML model information as the "mLModelInfos" attribute;

- the ML model training information as the "mLModelTrainInfos" attribute;

- identification of the ML procesure for training the ML model as the "mlCorreId" attribute;

- an indication of preparation request for ML model training as the "mLPreFlag" attribute;

- an indication of request using the local training data as the testing dataset to calculate the Model Accuracy of the global ML model provided by the consumer as the "mLAccChkFlg" attribute;

- the ML model training reporting information as the "mLTrainRepInfo" attribute;

- the round number of the training in a multi-round training process as the "roundInd" attribute;

- the use case context of the ML model as the "uCaseCont" attribute; and

- the reporting requirement information of the subscription as the "eventReq" attribute.

Upon the reception of an HTTP POST request with: "{apiRoot}/nnwdaf-mlmodeltraining/<apiVersion>/subscriptions" as Resource URI and NwdafMLModelTrainSubsc data structure as request body, the NWDAF shall create a new subscription and store the subscription.

If the NWDAF created an "Individual NWDAF ML Model Training Subscription" resource, the NWDAF shall respond with "201 Created" with the message body containing a representation of the created subscription, as shown in figure 4.6.2.2.2-1, step 2. The NWDAF shall include a Location HTTP header field. The Location header field shall contain the URI of the created subscription i.e. "{apiRoot}/nnwdaf-mlmodeltraining/<apiVersion>/subscriptions/{subscriptionId}".

If the immediate reporting indication in the "immRep" attribute within the "eventReq" attribute sets to "true" during the event subscription, the NWDAF shall include the reports of the subscribed events, if available, as the "immReport" attribute in the HTTP POST response.

NOTE: Immediate and one-time reporting can be used in order to implement the Nnwdaf\_MLModelTrainingInfo service, which is defined in 3GPP TS 23.288 [17].

If not all the requested events in the subscription are accepted, then the NWDAF may include the "failEventReports" attribute indicating the event(s) for which the subscription failed and the associated reason(s).

If there is no associated ML model training available for all provided "mLEvent" attributes, the NWDAF shall send a "500 Internal Server Error" status code to the NF service consumer, including the "cause" attribute set to "UNAVAILABLE\_ML\_MODEL\_TRAINING\_FOR\_ALLEVENTS".

If there is no ML model training satisfying the requirements listed in "mLModelTrainInfos" attribute or the ML model cannot be downloaded successfully, the NWDAF which contains MTLF shall send a "403 Forbidden" status code to the NF service consumer, and it may include also the corresponding failure reason via a "problemDetails" attribute with the "cause" attribute set to "ML\_MODEL\_TRAINING\_REQS\_NOT\_MET", "ML\_TRAINING\_NOT\_COMPLETE", "OVERLOAD", or "NOT\_AVAILABLE\_FOR\_FL\_PROCESS\_ANYMORE".

If other errors occur when processing the HTTP POST request, the NWDAF shall send an HTTP error response as specified in clause 5.5.7.

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

##### 4.6.2.2.3 Update subscription for event notifications

Figure 4.6.2.2.3-1 shows a scenario that the NF service consumer sends an HTTP PUT request to the NWDAF to modify an existing subscription (as shown in 3GPP TS 23.288 [17]).



Figure 4.6.2.2.3-1: Modification of events subscription information using HTTP PUT

The NF service consumer shall invoke the Nnwdaf\_MLModelTraining\_Subscribe service operation to modify an existing ML Model Training subscription. The NF service consumer shall send an HTTP PUT request with: "{apiRoot}/nnwdaf-mlmodeltraining/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI, where "{subscriptionId}" is the event subscriptionId of the existing subscription to be modified, to update an "Individual NWDAF ML Model Training Subscription" according to the information in the message body. The NwdafMLModelTrainSubsc data structure provided in the request body shall include the same contents as described in clause 4.6.2.2.2.

Upon receipt of an HTTP PUT request with: "{apiRoot}/nnwdaf-mlmodeltraining/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI and NwdafMLModelTrainSubsc data type as request body, if the request is successfully processed and accepted, the NWDAF shall:

- modify the concerned subscription; and

- store the subscription.

If the NWDAF successfully processed and accepted the received HTTP PUT request, the NWDAF shall update an "Individual NWDAF ML Model Training Subscription" resource, and shall respond with:

- HTTP "204 No Content" response (as shown in figure 4.6.2.2.3-1, step 2a); or

- HTTP "200 OK" response (as shown in figure 4.6.2.2.3-1, step 2b) with a response body containing a representation of the updated subscription in the NwdafMLModelTrainSubsc data type.

If not all the requested events in the subscription are modified successfully, then the NWDAF may include the "failEventReports" attribute indicating the event(s) for which the subscription failed and the associated reason(s).

If the immediate reporting indication in the "immRep" attribute within the "eventReq" attribute sets to "true" during the event subscription update, the NWDAF shall include the reports of the subscribed events, if available, as the "immReport" attribute in the HTTP PUT response.

NOTE: Immediate and one-time reporting can be used in order to implement the Nnwdaf\_MLModelTrainingInfo service, which is defined in 3GPP TS 23.288 [17].

If there is no associated ML model training available for all provided "mLEvent" attributes, the NWDAF shall send a "500 Internal Server Error" status code to the NF service consumer, including the "cause" attribute set to "UNAVAILABLE\_ML\_MODEL\_TRAINING\_FOR\_ALLEVENTS".

If there is no ML model training satisfying the requirements listed in "mLModelTrainInfos" attribute or the ML model cannot be downloaded successfully, the NWDAF which contains MTLF shall send a "403 Forbidden" status code to the NF service consumer, and it may include also the corresponding failure reason via a "problemDetails" attribute with the "cause" attribute set to "ML\_MODEL\_TRAINING\_REQS\_NOT\_MET", "ML\_TRAINING\_NOT\_COMPLETE", "OVERLOAD", or "NOT\_AVAILABLE\_FOR\_FL\_PROCESS\_ANYMORE".

If other errors occur when processing the HTTP PUT request, the NWDAF shall send an HTTP error response as specified in clause 5.5.7.

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

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

##### 4.6.2.2.4 Partial update subscription for event notifications

Figure 4.6.2.2.4-1 shows a scenario that the NF service consumer sends an HTTP PATCH request to the NWDAF to partial modify an existing subscription (as shown in 3GPP TS 23.288 [17]).



Figure 4.6.2.2.4-1: Partial modification of events subscription information using HTTP PATCH

The NF service consumer shall invoke the Nnwdaf\_MLModelTraining\_Subscribe service operation to partial modify an existing ML Model Training subscription. The NF service consumer shall send an HTTP PATCH request with: "{apiRoot}/nnwdaf-mlmodeltraining/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI, where "{subscriptionId}" is the event subscriptionId of the existing subscription to be modified, to update an "Individual NWDAF ML Model Training Subscription" according to the information in the message body.

Upon receipt of an HTTP PATCH request with: "{apiRoot}/nnwdaf-mlmodeltraining/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI and NwdafMLModelTrainSubscPatch data type as request body, if the request is successfully processed and accepted, the NWDAF shall:

- partial modify the concerned subscription; and

- store the subscription.

If the NWDAF successfully processed and accepted the received HTTP PATCH request, the NWDAF shall partial update an "Individual NWDAF ML Model Training Subscription" resource, and shall respond with:

- HTTP "204 No Content" response (as shown in figure 4.6.2.2.4-1, step 2a); or

- HTTP "200 OK" response (as shown in figure 4.6.2.2.4-1, step 2b) with a response body containing a representation of the updated subscription in the NwdafMLModelTrainSubsc data type.

If not all the requested events in the subscription are modified successfully, then the NWDAF may include the "failEventReports" attribute indicating the event(s) for which the subscription failed and the associated reason(s).

If the immediate reporting indication in the "immRep" attribute within the "eventReq" attribute sets to "true" during the event subscription update, the NWDAF shall include the reports of the subscribed events, if available, as the "immReport" attribute in the HTTP PUT response.

NOTE: Immediate and one-time reporting can be used in order to implement the Nnwdaf\_MLModelTrainingInfo service, which is defined in 3GPP TS 23.288 [17].

If there is no associated ML model training available for all provided "mLEvent" attributes, the NWDAF shall send a "500 Internal Server Error" status code to the NF service consumer, including the "cause" attribute set to "UNAVAILABLE\_ML\_MODEL\_TRAINING\_FOR\_ALLEVENTS".

If there is no ML model training satisfying the requirements listed in "mLModelTrainInfos" attribute or the ML model cannot be downloaded successfully, the NWDAF which contains MTLF shall send a "403 Forbidden" status code to the NF service consumer, and it may include also the corresponding failure reason via a "problemDetails" attribute with the "cause" attribute set to "ML\_MODEL\_TRAINING\_REQS\_NOT\_MET", "ML\_TRAINING\_NOT\_COMPLETE", "OVERLOAD", or "NOT\_AVAILABLE\_FOR\_FL\_PROCESS\_ANYMORE".

If other errors occur when processing the HTTP PATCH request, the NWDAF shall send an HTTP error response as specified in clause 5.5.7.

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

\*\*\* 4th Change \*\*\*

##### 5.5.5.2.2 Operation Definition

Callback URI: **{notifUri}**

The operation shall support the callback URI variables defined in table 5.5.5.2.2-1, the request data structures specified in table 5.5.5.2.2-2 and the response data structure and response codes specified in table 5.5.5.2.2-3.

Table 5.5.5.2.2-1: Callback URI variables

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| notifUri | Uri | The Notification Uri as assigned within the Individual NWDAF ML Model Training Subscription and described within the NwdafMLModelTrainSubsc/NwdafMLModelTrainSubscPatch data types (see tables 5.5.6.2.2-1 and 5.5.6.2.3-1). |

Table 5.5.5.2.2-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| NwdafMLModelTrainNotif | M | 1 | Provides Information about observed events. |

**Table 5.5.5.2.2-3: Data structures supported by the POST Response Body on this resource**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data type** | **P** | **Cardinality** | **Response codes** | **Description** |
| n/a |  |  | 204 No Content | The receipt of the Notification is acknowledged. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply. |

Table 5.5.5.2.2-4: Headers supported by the 307 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected. |

Table 5.5.5.2.2-5: Headers supported by the 308 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

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

##### 5.5.6.2.2 Type NwdafMLModelTrainSubsc

Table 5.5.6.2.2-1: Definition of type NwdafMLModelTrainSubsc

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| eventReq | ReportingInformation | O | 0..1 | Reporting requirement information of the subscription.If omitted, the default values within the ReportingInformation data type apply. |  |
| failEventReports | array(FailureEventInfoForMLModelTrain) | O | 1..N | Supplied by the NWDAF containing MTLF when available, shall contain the event(s) that the subscription is not successful including the failure reason(s). |  |
| mlCorreId | string | C | 0..1 | Identifies the Machine Learning procedure for training the ML model.It shall be present when the service is for Federated Learning. |  |
| mLEventSubscs | array(MLEventSubscription) | M | 1..N | Each element identifies the subscription for each event. The "modelInterInfo" attribute within the MLEventSubscription data type shall be provided. |  |
| mLModelInfos | array(MLEventNotif) | O | 1..N | Each element contains ML Model information for a specific analytics type. (NOTE) |  |
| immReport | NwdafMLModelTrainNotif | O | 0..1 | Immediately reported ML Model Training notifications. It may only be provided in the HTTP POST response of a subscription creation/update and only if the immediate reporting flag was set to "true" in the HTTP POST request. |  |
| mLModelTrainInfos | array(MLModelTrainInfo) | O | 1..N | Each element represents the ML Model training information for each event, include requirement on data availability and time availability. |  |
| mLPreFlag | boolean | C | 0..1 | Indicates whether the subscription is for preparation of ML Model training. Set to "true" if it is for ML training preparation, otherwise set to "false".Default value is "false" if omitted.It shall be present when the service is for preparation of Federated Learning. |  |
| mLAccChkFlg | boolean | O | 0..1 | Indicates whether request using the local training data as the testing dataset to calculate the Model Accuracy of the global ML model provided by the consumer. Set to "true" if it is requested, otherwise set to "false".Default value is "false" if omitted. |  |
| mLTrainRepInfo | MLTrainReportInfo | O | 0..1 | Indicates the training reporting information.This attribute can be provided when the "notifMethod" attribute within the ReportingInformation structure is set to "ON\_EVENT\_DETECTION" in the "eventReq" attribute. |  |
| notifCorreId | string | M | 1 | The value of Notification Correlation ID in the corresponding notification. |  |
| notifUri | Uri | M | 1 | URI at which the NF service consumer requests to receive notifications. |  |
| roundInd | Uinteger | O | 0..1 | Indicates the round number of the training in a multi-round training process. |  |
| suppFeats | SupportedFeatures | C | 0..1 | List of Supported features used as described in clause 5.5.8.It shall be supplied by NF service consumer in the POST requests that request the creation of an NWDAF ML Model Training Subscriptions resource and shall be supplied by the NWDAF in the reply of corresponding request. |  |
| tgtRepUe | TargetUeInformation | O | 0..1 | Indicates the UE(s) information for which data for ML model training is requested. |  |
| uCaseCont | string | O | 0..1 | Indicates the use case context of the ML model. The value and format of this parameter are not standardized. |  |
| NOTE: It is up to implementation to determine whether to include the "mlFile" arttribute in the "MLEventNotif" data structure considering ML Model file size, etc. |

\*\*\* 6th Change \*\*\*

# A.6 Nnwdaf\_MLModelTraining API

openapi: 3.0.0

info:

 title: Nnwdaf\_MLModelTraining

 version: 1.0.0-alpha.3

 description: |

 Nnwdaf\_MLModelTraining API Service.

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externalDocs:

 description: 3GPP TS 29.520 V18.4.0; 5G System; Network Data Analytics Services.

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

servers:

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

 variables:

 apiRoot:

 default: https://example.com

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

security:

 - {}

 - oAuth2ClientCredentials:

 - nnwdaf-mlmodeltraining

paths:

 /subscriptions:

 post:

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

 operationId: CreateNWDAFMLModelTrainingSubcription

 tags:

 - Subscriptions (Collection)

 requestBody:

 required: true

 content:

 application/json:

 schema:

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

 responses:

 '201':

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

 content:

 application/json:

 schema:

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

 headers:

 Location:

 description: >

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

 {apiRoot}/nnwdaf-mlmodeltraining/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:

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

 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 Training Subscription

 operationId: UpdateNWDAFMLModelTrainingSubcription

 tags:

 - Individual NWDAF ML Model Training Subscription (Document)

 requestBody:

 required: true

 content:

 application/json:

 schema:

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

 parameters:

 - name: subscriptionId

 in: path

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

 required: true

 schema:

 type: string

 responses:

 '200':

 description: >

 The Individual NWDAF ML Model Training Subscription resource was modified successfully

 and a representation of that resource is returned.

 content:

 application/json:

 schema:

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

 '204':

 description: >

 The Individual NWDAF ML Model Training 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'

 patch:

 summary: partial update an existing Individual NWDAF ML Model Training Subscription

 operationId: PartialUpdateNWDAFMLModelTrainingSubcription

 tags:

 - Individual NWDAF ML Model Training Subscription (Document)

 requestBody:

 required: true

 content:

 application/merge-patch+json:

 schema:

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

 parameters:

 - name: subscriptionId

 in: path

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

 required: true

 schema:

 type: string

 responses:

 '200':

 description: >

 The Individual NWDAF ML Model Training Subscription resource was partial modified

 successfully and a representation of that resource is returned.

 content:

 application/json:

 schema:

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

 '204':

 description: >

 The Individual NWDAF ML Model Training Subscription resource was partial 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 Training Subscription.

 operationId: DeleteNWDAFMLModelTrainingSubcription

 tags:

 - Individual NWDAF ML Model Training Subscription (Document)

 parameters:

 - name: subscriptionId

 in: path

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

 required: true

 schema:

 type: string

 responses:

 '204':

 description: >

 No Content. The Individual NWDAF ML Model Training 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-mlmodeltraining: Access to the Nnwdaf\_MLModelTraining API

 schemas:

 NwdafMLModelTrainSubsc:

 description: Represents a ML Model Training subscription.

 type: object

 properties:

 mLEventSubscs:

 type: array

 items:

 $ref: 'TS29520\_Nnwdaf\_MLModelProvision.yaml#/components/schemas/MLEventSubscription'

 minItems: 1

 description: Subscribed events

 notifUri:

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

 suppFeats:

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

 eventReq:

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

 failEventReports:

 type: array

 items:

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

 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).

 mlCorreId:

 type: string

 description: String identifying the subscription is for a Federated Learning procedure.

 mLModelInfos:

 type: array

 items:

 $ref: 'TS29520\_Nnwdaf\_MLModelProvision.yaml#/components/schemas/MLEventNotif'

 minItems: 1

 description: Represents the ML Model information.

 immReport:

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

 description: Immediately reported ML Model Training notifications.

 mLModelTrainInfos:

 type: array

 items:

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

 minItems: 1

 description: Represents the ML Model training information.

 mLPreFlag:

 type: boolean

 description: >

 Indicates whether the subscription is for preparation of ML Model training. Set to

 "true" if it is for ML training preparation, otherwise set to "false".

 mLAccChkFlg:

 type: boolean

 description: >

 Indicates whether request using the local training data as the testing dataset to

 calculate the Model Accuracy of the global ML model provided by the consumer. Set to

 "true" if it is requested, otherwise set to "false".

 mLTrainRepInfo:

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

 notifCorreId:

 type: string

 description: >

 String identifying the Notification Correlation ID in the corresponding notification.

 roundInd:

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

 tgtRepUe:

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

 uCaseCont:

 type: string

 description: >

 String identifying the use case context of the ML model. The value and format of this

 parameter is not standardized.

 required:

 - mLEventSubscs

 - notifUri

 - notifCorreId

 NwdafMLModelTrainSubscPatch:

 description: >

 Represents parameters to request the modification of a ML Model Training subscription.

 type: object

 properties:

 notifUri:

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

 eventReq:

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

 mLModelInfos:

 type: array

 items:

 $ref: 'TS29520\_Nnwdaf\_MLModelProvision.yaml#/components/schemas/MLEventNotif'

 minItems: 1

 description: Represents the ML Model information.

 mLModelTrainInfos:

 type: array

 items:

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

 minItems: 1

 description: Represents the ML Model training information.

 mLPreFlag:

 type: boolean

 description: >

 Indicates whether the subscription is for preparation of ML Model training. Set to

 "true" if it is for ML training preparation, otherwise set to "false".

 mLAccChkFlg:

 type: boolean

 description: >

 Indicates whether request using the local training data as the testing dataset to

 Calculate the Model Accuracy of the global ML model provided by the consumer. Set to

 "true" if it is requested, otherwise set to "false".

 mLTrainRepInfo:

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

 roundInd:

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

 tgtRepUe:

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

 uCaseCont:

 type: string

 description: >

 String identifying the use case context of the ML model. The value and format of this

 parameter are not standardized.

 NwdafMLModelTrainNotif:

 description: Represents notifications on events that occurred.

 type: object

 properties:

 delayEventNotif:

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

 mlCorreId:

 type: string

 description: String identifying the subscription is for a Federated Learning procedure.

 mLModelInfos:

 type: array

 items:

 $ref: 'TS29520\_Nnwdaf\_MLModelProvision.yaml#/components/schemas/MLEventNotif'

 minItems: 1

 description: Represents the ML Model information.

 notifCorreId:

 type: string

 description: >

 String identifying the Notification Correlation ID in the corresponding notification.

 roundInd:

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

 statusReport:

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

 termTrainReq:

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

 uCaseCont:

 type: string

 description: >

 String identifying the context of use of ML model. The value and format of this

 parameter are not standardized.

 required:

 - notifCorreId

 oneOf:

 - required: [delayEventNotif]

 - required: [mLModelInfos]

 - required: [termTrainReq]

 - required: [mLModelInfos, termTrainReq]

 MLModelTrainInfo:

 description: >

 Represents the ML Model training information, include requirement on data availability and

 time availability, training filter information.

 type: object

 properties:

 dataAvReq:

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

 timeAvReq:

 type: string

 description: >

 String representing the requirement on available time for the ML model training.

 MLTrainReportInfo:

 description: Represents the ML Model training reporting information.

 type: object

 properties:

 maxResTime:

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

 FailureEventInfoForMLModelTrain:

 description: Represents the failure event information for a ML Model Training subscription.

 type: object

 properties:

 mLTrainEvent:

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

 failureCodeTrain:

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

 required:

 - mLTrainEvent

 - failureCodeTrain

 DataAvReq:

 description: Represents the requirement on available data for the ML model training.

 type: object

 properties:

 dataStatProps:

 type: array

 items:

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

 minItems: 1

 inpEvents:

 type: array

 items:

 $ref: 'TS29574\_Ndccf\_DataManagement.yaml#/components/schemas/DccfEvent'

 minItems: 1

 minNumSamples:

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

 timeWindows:

 type: array

 items:

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

 minItems: 1

 required:

 - inpEvents

 DelayEventNotif:

 description: >

 Indicating that the NWDAF containing MTLF is not able to complete the training of ML model

 within the maximum response time, the cause code, and the expected time complete the

 training.

 type: object

 properties:

 delayEventInd:

 type: boolean

 description: >

 Indicates that the NWDAF containing MTLF is not able to complete the training of ML

 model within the maximum response time. Set to "true" if not able to complete the ML

 model training on time, otherwise set to "false".

 delayCause:

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

 expCompTime:

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

 required:

 - delayEventInd

 StatusReportInfo:

 description: >

 Indicating status information generated by the NWDAF containing MTLF during ML model

 training.

 type: object

 properties:

 mlModelAcc:

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

 trainInDataInfo:

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

 TrainDataInfo:

 description: Represents the training input data information.

 type: object

 properties:

 areaDataSet:

 type: string

 description: Indicates the areas covered by the data set.

 maxValues:

 type: array

 items:

 type: string

 minItems: 1

 description: Represents the maximum value of one dimension of data.

 minValues:

 type: array

 items:

 type: string

 minItems: 1

 description: Represents the minimum value of one dimension of data.

 samplRatio:

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

#

# ENUMERATIONS DATA TYPES

#

 FailureCodeTrain:

 anyOf:

 - type: string

 enum:

 - UNAVAILABLE\_ML\_MODEL\_TRAIN

 - 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 reason.

 Possible values are:

 - UNAVAILABLE\_ML\_MODEL\_TRAIN: The ML model training is unavailable.

 TermTrainCause:

 anyOf:

 - type: string

 enum:

 - NWDAF\_OVERLOAD

 - NOT\_AVAILABLE\_ML\_TRAIN

 - OTHERS

 - 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 reasons that ML Model Training to be terminated.

 Possible values are:

 - NWDAF\_OVERLOAD: The NWDAF is overloaded for the ML model training.

 - NOT\_AVAILABLE\_ML\_TRAIN: The ML model training process is not available.

 - OTHERS: Other cause.

 DelayCause:

 anyOf:

 - type: string

 enum:

 - ML\_MODEL\_TRAIN\_FAILURE

 - NEED\_MORE\_TIME

 - OTHERS

 - 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 reasons for ML Model training delay.

 Possible values are:

 - ML\_MODEL\_TRAIN\_FAILURE: The ML model training is failure.

 - NEED\_MORE\_TIME: The ML model training needs more time.

 - OTHERS: Other cause.

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