**3GPP TSG- WG3 Meeting # *r2***

**Xiamen, China, 9 - 13 October, 2023**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **29.575** | **CR** | **0068** | **rev** | **-** | **Current version:** | **18.3.0** |  |
|  | | | | | | | | |
| *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:*** | Updates to Nadrf\_MLModelManagement API for StorageRequest | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson, Intel | | | | | | | | | |
| ***Source to TSG:*** | CT3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | eNA\_Ph3 | | | | |  | ***Date:*** | | | 2023-09-27 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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 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:*** | | As in TS 23.288 clause 10.3.2, the parameter "ML model(s)" is added as required inputs of the Nadrf\_MLModelManagement\_StorageRequest service operation, this CR proposes to update the Nadrf\_MLModelManagement API for Nadrf\_MLModelManagement\_StorageRequest. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The changes include:   * Updated description in clause 4.3.2.2.2. * Added data type "Binary" to Table 5.2.6.1-2. * Added "mlModels" attribute to the "NadrfMLModelStoreRecord" data type in Table 5.2.6.2.2-1. * Corrected errors in clause 5.2.6.2.3. * Defined new data type "MLModel" in clause 5.2.6.2.X. * Updated the corresponding places in A.3. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Misalignment with stage 2 of Nadrf\_MLModelManagement API for Nadrf\_MLModelManagement\_StorageRequest service operation. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.3.2.2.2, 5.2.6.1, 5.2.6.2.2, 5.2.6.2.3, 5.2.6.2.X(new), A.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 backwards compatible feature to the Nadrf\_MLModelManagement API. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**Additional discussion(if needed):**

**Proposed changes:**

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

##### 4.3.2.2.2 Request Storage of ML model(s)

Figure 4.3.2.2.2-1 shows a scenario where the NF service consumer sends a request to the ADRF to store ML model(s).



Figure 4.3.2.2.2-1: NF service consumer requesting to store ML model(s)

The NF service consumer shall invoke the Nadrf\_MLModelManagement\_StorageRequest service operation to store ML model(s). The NF service consumer shall send an HTTP POST request with "{apiRoot}/nadrf-mlmodelmanagement/<apiVersion>/mlmodel-store-records" as Resource URI representing the "ADRF ML Model Store Records" resource, as shown in figure 4.3.2.2.2-1, step 1, to create an "Individual ADRF ML Model Store Record" according to the information in the message body. The NadrfMLModelStoreRecord data structure provided in the request body shall include either the MLModelInfo data structure in the "mlModelInfo" attribute or the MLModel data structure in the "mlModels" attribute. If the MLModelInfo data structure is provided, the unique ML model identifier within the "modelUniqueId" attribute, the address of the ML model within the "mlFileAddr" attribute, and the storage size required for each of the ML model(s) in the "mlStorageSize" attribute shall be included. If the MLModel data structure is provided, the unique ML model identifier within the "modelUniqueId" attribute and the ML model within the "mlModel" attribute shall be included.

Upon the reception of an HTTP POST request with "{apiRoot}/nadrf-mlmodelmanagement /<apiVersion>/mlmodel-store-records" as Resource URI and NadrfMLModelStoreRecord data structure as request body, the ADRF shall:

- create a new ML model store record;

- assign a storeTransId;

- download and store the ML model(s).

NOTE 1: If the ML model(s) are already stored or being stored in the ADRF, the ADRF will still create a new "Individual ADRF ML Model Store Record" resource and assign a new storeTransId if the ADRF intends to not really store the ML model(s) in the memory again based on the implementation.

If the ADRF created an "Individual ADRF ML Model Store Record" resource, the ADRF shall respond with "201 Created" with the message body containing a representation of the created ML model record, as shown in figure 4.3.2.2.2-1, step 2. The ADRF shall include the MLModelInfo data structure in the "mlModelInfo" attribute with the unique ML model identifier in the "modelUniqueId" attribute and the ML model address in "mlFileAddr" attribute within the HTTP POST response. The ADRF may include a Location HTTP header field. The Location header field shall contain the URI of the created record i.e. "{apiRoot}/nadrf- mlmodelmanagement/<apiVersion>/mlmodel-store-records/{storeTransId}".

If an error occurs when processing the HTTP POST request, the ADRF shall send an HTTP error response as specified in clause 5.2.6.

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

#### 5.2.6.1 General

This clause specifies the application data model supported by the Nadrf\_MLModelManagement API.

Table 5.2.6.1-1 specifies the data types defined for the Nadrf\_MLModelManagement service based interface protocol.

Table 5.2.6.1-1: Nadrf\_MLModelManagement specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Clause defined | Description | Applicability |
| NadrfMLModelStoreRecord | 5.2.6.2.2 | Represents an Individual ADRF ML Model Store Record resource. |  |
| MLModel | 5.2.6.2.X | Represents an ML model. |  |
| MLModelInfo | 5.2.6.2.3 | Represents informatiom of the ML Model. |  |

Table 5.2.6.1-2 specifies data types re-used by the Nadrf\_MLModelManagement 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 Nadrf\_MLModelManagement service based interface.

Table 5.2.6.1-2: Nadrf\_MLModelManagement re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| Binary | 3GPP TS 29.571 [16] | String with format "binary". |  |
| MLModelAddr | 3GPP TS 29.520 [15] | Address of ML model file |  |
| NfInstanceId | 3GPP TS 29.571 [16] | NF instance identifier. |  |
| NfSetId | 3GPP TS 29.571 [16] | NF set identifier. |  |
| SupportedFeatures | 3GPP TS 29.571 [16] | Used to negotiate the applicability of the optional features defined in table 5.2.8-1. |  |
| Uinteger | 3GPP TS 29.571 [16] | Unsigned Integer, i.e. only value 0 and integers above 0 are permissible. |  |

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

##### 5.2.6.2.2 Type: NadrfMLModelStoreRecord

Table 5.2.6.2.2-1: Definition of type NadrfMLModelStoreRecord

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| nfInstanceId | NfInstanceId | C | 1 | NF instanceIdentifier of the NWDAF containing MTLF.  (NOTE 1) |  |
| nfSetId | NfSetId | C | 1 | NFset identifier of the NWDAF containing MTLF.  (NOTE 1) |  |
| mlModelInfo | array(MLModelInfo) | C | 1..N | ML Model information.  (NOTE 2) |  |
| mlModels | array(MLModel) | C | 1..N | Each element represents an ML model.  (NOTE 2) |  |
| suppFeat | SupportedFeatures | C | 0..1 | This IE represents a list of Supported features as described in clause 5.2.7.  It shall be present if at least one feature defined in clause 5.2.7 is supported. |  |
| NOTE 1: One of "nfInstanceId" and "nfSetId" attributes shall be provided.  NOTE 2: One of the "mlModelInfo" and "mlModels" attributes shall be provided. | | | | | |

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

##### 5.2.6.2.3 Type: MLModelInfo

Table 5.2.6.2.3-1: Definition of type MLModelInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| modelUniqueId | Uinteger | M | 1 | Unique ML Model identifier |  |
| mlFileAddr | MLModelAddr | M | 1 | Address (e.g. a URL or an FQDN) of the ML model file. |  |
| mlStorageSize | Uinteger | M | 1 | Storage size in octets required for each of the ML model. |  |

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

##### 5.2.6.2.X Type: MLModel

Table 5.2.6.2.X-1: Definition of type MLModel

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| modelUniqueId | Uinteger | M | 1 | Unique ML Model identifier |  |
| mlModel | Binary | M | 1 | Represents an ML model. The value is out of 3GPP. |  |

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

# A.3 Nadrf\_MLModelManagement API

openapi: 3.0.0

info:

version: 1.0.0-alpha.1

title: Nadrf\_MLModelManagement

description: |

ADRF ML Model Management Service.

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externalDocs:

description: 3GPP TS 29.575 V18.3.0; 5G System; Analytics Data Repository Services; Stage 3.

url: 'https://www.3gpp.org/ftp/Specs/archive/29\_series/29.575/'

#

servers:

- url: '{apiRoot}/nadrf-mlmodelmanagement/v1'

variables:

apiRoot:

default: https://example.com

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

#

security:

- {}

- oAuth2ClientCredentials:

- nadrf-mlmodelmanagement

#

paths:

/mlmodel-store-records:

post:

summary: Creates a new Individual ADRF ML Model Store Record resource.

operationId: CreateADRFMLModelStoreRecord

tags:

- ADRF ML Model Store Records (Collection)

requestBody:

content:

application/json:

schema:

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

required: true

description: ADRF ML model store record to be stored.

responses:

'201':

description: Successful creation of new Individual ADRF ML Model Store Record resource.

headers:

Location:

description: >

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

{apiRoot}/nadrf-mlmodelmanagement/<apiVersion>/mlmodel-store-records/{storeTransId}

required: true

schema:

type: string

content:

application/json:

schema:

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

'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'

get:

summary: Retrieves existing Individual ADRF ML Model Store Record.

operationId: GetAdrfMLModelStoreRecord

tags:

- ADRF ML Model Store Records (Collection)

parameters:

- name: store-trans-id

description: A storage transaction identifier of a ML model store record in ADRF.

in: query

required: false

schema:

type: string

- name: modelUniqueId

description: Unique Model identifier of a ML model.

in: query

required: false

schema:

type: array

items:

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

minItems: 1

responses:

'200':

description: ML model store records are returned.

content:

application/json:

schema:

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

'204':

description: No matching ADRF ML Model were found.

'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'

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'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'

/mlmodel-store-records/{storeTransId}:

delete:

summary: Delete an existing Individual ADRF ML Model Store Record.

operationId: DeleteADRFMLModelStoreRecord

tags:

- Individual ADRF ML Model Store Record (Document)

parameters:

- name: storeTransId

in: path

description: String identifying a ML Model Store Record in ADRF.

required: true

schema:

type: string

responses:

'204':

description: >

No Content. The Individual ADRF ML Model Store Record resource matching the

storeTransId 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'

/remove-stored-mlmodel:

post:

summary: Remove stored ML model based on unique ML model identifier.

operationId: DeleteADRFMLModel

tags:

- ADRF Stored ML Model

requestBody:

content:

application/json:

schema:

type: array

items:

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

minItems: 1

required: true

responses:

'204':

description: No Content. The ADRF ML model matching the provided unique ML model identifier is deleted.

'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'

#

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{nrfApiRoot}/oauth2/token'

scopes:

nadrf-mlmodelmanagement: Access to the nadrf-mlmodelmanagement API

#

schemas:

#

NadrfMLModelStoreRecord:

description: Represents an Individual ADRF ML Model Store Record.

type: object

allOf:

- oneOf:

- required: [nfInstanceId]

- required: [nfSetId]

- oneOf:

- required: [mlModelIdnfo]

- required: [mlModels]

properties:

nfInstanceId:

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

nfSetId:

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

mlModelInfo:

type: array

items:

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

minItems: 1

description: List of ML Model Information.

mlModels:

type: array

items:

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

minItems: 1

description: Represents ML Model(s).

suppFeat:

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

#

MLModelInfo:

description: Represents informatiom of the ML Model.

type: object

allOf:

- required: [modelUniqueId]

- required: [mlFileAddr]

- required: [mlStrorageSize]

properties:

modelUniqueId:

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

mlModelAddr:

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

mlStrorageSize:

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

MLModel:

description: Represents an ML Model.

type: object

allOf:

- required: [modelUniqueId]

- required: [mlModel]

properties:

modelUniqueId:

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

mlModel:

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

#

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