**3GPP TSG-CT WG3 Meeting #130C3-234070**

**Xiamen, China, 9 - 13 October, 2023 (revision of C3-233abc)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **29.575** | **CR** | **0062** | **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:*** | Update the Nadrf\_MLModelManagement\_RetrievalRequest service | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, Ericsson, Intel | | | | | | | | | |
| ***Source to TSG:*** | CT3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | eNA\_Ph3 | | | | |  | ***Date:*** | | | 2023-09-25 |
|  |  | | | |  | |  | | |  |
| ***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 agreed by S2-2308904, Nadrf\_MLModelManagement\_Retrieval service operation should be Nadrf\_MLModelManagement\_RetrievalRequest. * According to clause X.10 of TS 33.501, the allowed consumer list may be provided in the request. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Update Nadrf\_MLModelManagement\_Retrieval to be Nadrf\_MLModelManagement\_RetrievalRequest service operation. * Support the consumer to provide the allowed consumer list in the request. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Misalignment between stage 2 and stage 3. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.1, 4.3.2.1, 4.3.2.3, 4.3.2.3.1, 4.3.2.3.2, 5.2.6.2.3, 5.2.6.2.4, 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:*** | | The CR introduces backward compatible feature to the OpenAPI file for Nadrf\_MLModelManagement API. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\* \* \* First Change \* \* \* \*

## 4.1 Introduction

The Analytics Data Repository Service is used for the Analytics Data Repository Function (ADRF) to storage and retrieval of data and ML model(s) by e.g. Consumers NF(s) (e.g. NWDAF) which access the data or ML model(s) using Nadrf service. The ADRF offers to other NFs the following services:

Table 4.1-1: Service provided by ADRF

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Service Name | Description | Service Operations | Operation  Semantics | Example Consumer(s) |
| Nadrf\_DataManagement  (NOTE 1) | This service enables the NF service consumers to store, retrieve and remove the data or analytics in an ADRF. | StorageRequest | Request / Response | DCCF, NWDAF, MFAF |
| StorageSubscriptionRequest | Request / Response | DCCF, NWDAF |
| StorageSubscriptionRemoval | Request / Response | DCCF, NWDAF |
| RetrievalRequest | Request / Response | DCCF, NWDAF |
| RetrievalSubscribe | Subscribe / Notify | DCCF, NWDAF |
| RetrievalUnsubscribe | Subscribe / Notify | DCCF, NWDAF |
| RetrievalNotify | Subscribe / Notify | DCCF, NWDAF |
| Delete | Request / Response | DCCF, NWDAF |
| Nadrf\_MLModelManagement  (NOTE 2) | This service enables the NF service consumers to store, retrieve and delete ML model(s) in an ADRF. | StorageRequest | Request / Response | NWDAF |
| RetrievalRequest | Request / Response | NWDAF |
| Delete | Request / Response | NWDAF |
| NOTE 1: The services correspond to the Nadrf\_DataManagement service as defined in 3GPP TS 23.288 [14].  NOTE 2: The services correspond to the Nadrf\_MLModelManagement service as defined in 3GPP TS 23.288 [14]. | | | | |

Table 4.1-2 summarizes the corresponding APIs defined for this specification.

Table 4.1-2: API Descriptions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Service Name** | **Clause** | **Description** | **OpenAPI Specification File** | **apiName** | **Annex** |
| Nadrf\_DataManagement | 4.2 | API for Nadrf\_DataManagement |  | nadrf\_datamanagement | Annex A.2 Nadrf\_DataManagement API |
| Nadrf\_MLModelManagement | 4.3 | API for Nadrf\_MLModelManagement |  | nadrf\_mlmodelmanagement | Annex A.3 Nadrf\_ MLModelManagement API |

\*\*\* Next Change \*\*\*

#### 4.3.2.1 Introduction

Table 4.3.2.1-1: Operations of the Nadrf\_MLModelManagement Service

| Service operation name | Description | Initiated by |
| --- | --- | --- |
| Nadrf\_MLModelManagement\_StorageRequest | This service operation is used by an NF to request the ADRF to store or update ML model(s). ML model(s) or ML model address(es) are provided to the ADRF in the request message. | NF service consumer (NWDAF) |
| Nadrf\_MLModelManagement\_RetrievalRequest | This service operation is used by an NF to retrieve stored ML model(s) from the ADRF. | NF service consumer (NWDAF) |
| Nadrf\_MLModelManagement\_Delete | This service operation is used by an NF to delete stored ML model(s) or ML model address(es) in the ADRF. | NF service consumer (NWDAF) |

\*\*\* Next 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 the MLModelInfo data structure in the "mlModelInfo" attribute. The MLModelInfo data structure shall include 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.

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, the ML model address in "mlFileAddr" attribute, the storage size of the ML model in the "mlStorageSize" attribute and the allowed NF consumer list for the ML model in the "allowConsumerList" 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.

\*\*\* Next Change \*\*\*

#### 4.3.2.3 Nadrf\_MLModelManagement\_RetrievalRequest service operation

##### 4.3.2.3.1 General

The Nadrf\_MLModelManagement\_RetrievalRequest service operation is used by an NF service consumer to retrieve stored ML model(s).

\*\*\* Next Change \*\*\*

##### 4.3.2.3.2 Request and get stored ML model(s) from ADRF ML Model Store

Figure 4.3.2.3.2-1 shows a scenario where the NF service consumer sends a request to the ADRF to retrieve stored ML model(s).



Figure 4.3.2.3.2-1: NF service consumer requesting to retrieve stored ML model(s)

The NF service consumer shall invoke the Nadrf\_MLModelManagement\_RetrievalRequest service operation to retrieve stored ML model(s). The NF service consumer shall send an HTTP GET request with "{apiRoot}/nadrf-mlmodelmanagement/<apiVersion>/mlmodel-store-records" as Resource URI representing the "ADRF ML Model Store Records" resource, as shown in figure 4.3.2.3.2-1, step 1, to request ADRF ML model store records according to the storage transaction identifier within the "store-trans-id" attribute or the unique ML model identifier within the "modelUniqueId" attribute.

Upon the reception of the HTTP GET request, the ADRF shall:

- find the ML model(s) according to the requested parameters.

If one ore more of the requested ML model(s) are found, the ADRF shall respond with "200 OK" status code with the message body containing the NadrfMLModelStoreRecord data structure. The NadrfMLModelStoreRecord data structure in the response body shall include the MLModelInfo data structure in the "mlModelInfo" attribute with the unique ML model identifier in the "modelUniqueId" attribute and the address of the ML model file stored in the ADRF in the "mlFileAddr" attribute.

If the NF Service Consumer is not included in the allowed NF consumer list for the ML model and/or is not same as the NF of the NWDAF containing MTLF that stored the model, the ADRF shall send an HTTP "403 Forbidden" error response including the "cause" attribute set to "RETRIEVAL\_ML\_MODEL\_NOT\_ALLOWED".

If none of the requested ML model(s) exist, the ADRF shall respond with "204 No Content". If an error occurs when processing the HTTP GET request, the ADRF shall send an HTTP error response as specified in clause 5.2.7.

\*\*\* Next Change \*\*\*

##### 5.2.6.2.3 Type: MLModelInfo

Table 5.2.6.2.2-1: 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. |  |
| allowConsumerList | array(AllowedConsumer) | O | 1..N | The allowed NF consumer list for the ML model. |  |

\*\*\* Next Change \*\*\*

##### 5.2.6.2.4 Type: AllowedConsumer

Table 5.2.6.2.4-1: Definition of type AllowedConsumer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| nfInstanceId | NfInstanceId | C | 0..1 | Identification of NF instance. |  |
| nfSetId | NfSetId | C | 0..1 | Identification of NF instance set. |  |
| NOTE: One of "nfInstanceId" and "nfSetId" attributes shall be provided. | | | | | |

\*\*\* Next Change \*\*\*

#### 5.2.7.3 Application Errors

The application errors defined for the Nadrf\_MLModelManagement service are listed in Table 5.2.7.3-1.

Table 5.2.7.3-1: Application errors

|  |  |  |
| --- | --- | --- |
| Application Error | HTTP status code | Description |
| RETRIEVAL\_ML\_MODEL\_NOT\_ALLOWED | 403 Forbidden | Indicates that the retrieval of the ML model is not allowed. |

\*\*\* Next 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]

- required: [mlModelIdnfo]

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.

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'

mlFileAddr:

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

mlStrorageSize:

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

allowConsumerList:

type: array

items:

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

minItems: 1

description: The allowed consumer list of the ML Model.

#

AllowedConsumer:

description: Represents informatiom of the allowed consumer list of the ML Model.

type: object

properties:

nfInstanceId:

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

nfSetId:

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

oneOf:

- required: [nfInstanceId]

- required: [nfSetId]

#

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