**3GPP TSG-SA5 Meeting #156 *S5-244880***

**Maastricht, Netherlands, 19th Aug 2024 - 23rd Aug 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **28.105** | **CR** | **0154** | **rev** | **1** | **Current version:** | **18.4.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

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|  | | | | | | | | | | |
| ***Title:*** | Rel-18 CR TS 28.105 correct the ML model related attributes | | | | | | | | | |
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| ***Source to WG:*** | Huawei | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | AIML\_MGT | | | | |  | ***Date:*** | | | 2024-07-16 |
|  |  | | | |  | |  | | |  |
| ***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 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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | * The name of ML model ID in clause 7.5.1 is not align with that in clasue 7.2a.2.1. * According to the conclusion of the last meeting, the AIML inference simulation report reuses the AIML inference report. AIMLInferenceEmulationReport will not be defined separately. Correct it make consistence with Figure 7.3a.2.1.1-1. * The allowedValues of types of inference for RAN is not clear. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Correct some typos of ML model ID. * Change AIMLInferenceEmulationReport(s) to AIMLInferenceReport(s)and corresponding stage3 * Correct the allowedvalues with adding refernece and descriptions of inference for NG-RAN | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The description will make confusion. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.2a.2.1.1, 7.3a.2.2.1.1, 7.5.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Forge link: https://forge.3gpp.org/rep/sa5/MnS/-/merge\_requests/1304 | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| **1st modified section** |

#### 7.2a.2.1 MLModel

##### 7.2a.2.1.1 Definition

This IOC represents the ML model. ML model algorithm or ML model are not subject to standardization. It is name-contained by MLModelRepository.

This MLModel MOI can be created by the system (MnS producer) or pre-installed. The MnS consumer can request the system to delete the MLModel MOI.

The MLModel may contain 3 types of contexts - TrainingContext, ExpectedRunTimeContext and RunTimeContext which represent status and conditions of the MLModel. These contexts are of mLContext <<dataType>>, see clauses 7.4.3 and 7.5.1 for details.

It also contains a reference named retrainingEventsMonitorRef which is a pointer to ThresholdMnonitor MOI. This indicates the list of performance measurements and the corresponding thresholds that are monitored and used to identify the need for re-training by the MnS Producer. After the MLModel MOI has been instantiated, the MnS Consumer can request MnS producer to instantiate a ThresholdMonitor MOI and update the reference in the MLModel MOI that can be used by the MnS producer to decide on the re-training of the MLModel. The MnS producer can be ML Training MnS producer or AI/ML Inference MnS Producer.

##### 7.2a.2.1.2 Attributes

Table 7.2a.2.1.2-1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
| mLModelId | M | T | F | F | T |
| aIMLInferenceName | M | T | F | F | T |
| mLModelVersion | M | T | F | F | T |
| expectedRunTimeContext | M | T | T | F | T |
| trainingContext | CM | T | F | F | T |
| runTimeContext | O | T | F | F | T |
| supportedPerformanceIndicators | O | T | F | F | T |
| mLCapabilitiesInfoList | M | T | F | F | T |
| **Attribute related to role** |  |  |  |  |  |
| retrainingEventsMonitorRef | O | T | T | F | T |
| sourceTrainedMLModelRef | CM | T | F | F | T |

##### 7.2a.2.1.3 Attribute constraints

Table 7.2a.2.1.3-1

|  |  |
| --- | --- |
| Name | Definition |
| trainingContext Support Qualifier | Condition: The trainingContext represents the status and conditions related to training and should be added when training is completed. |
| sourceTrainedMLModelRef Support Qualifier | Condition: The MLModel MOI containing this attribute represents an ML model loaded to an inference function. |

##### 7.2a.2.1.4 Notifications

The common notifications defined in clause 7.6 are valid for this IOC, without exceptions or additions.

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| **Next modified sections** |

### 7.3a.2 Information model definitions for AI/ML inference emulation

#### 7.3a.2.1 Class diagram

##### 7.3a.2.1.1 Relationships

A diagram of a network

Description automatically generated

Figure 7.3a.2.1.1-1: NRM fragment for AI/ML inference emulation control

##### 7.3a.2.1.2 Inheritance

A diagram of a function

Description automatically generated

Figure 7.3a.2.1.2-1: AI/ML inference emulation Inheritance Relations

#### 7.3a.2.2 Class definitions

##### 7.3a.2.2.1 AIMLInferenceEmulationFunction

###### 7.3a.2.2.1.1 Definition

This IOC represents the properties of a function that undertakes AI/ML Inference Emulation.

This AIMLInferenceEmulationFunction instance is created by the system (AI/ML inference emulation MnS producer) or pre-installed, it can only be deleted by the system.

An AIMLInferenceEmulationFunction may be associated with one or more MLModel(s). AIMLInferenceEmulationFunction is name contained with AIMLInferenceReport(s) that delivers the outcomes of the emulation processes.

NOTE: The way of triggering of an AI/ML inference emulation and the instantiation of the related AI/ML inference emulation process is not in the scope of the present document.

###### 7.3a.2.2.1.2 Attributes

The AIMLInferenceEmulationFunction IOC includes attributes inherited from ManagedFunction IOC (defined in TS 28.622 [30]).

###### 7.3a.2.2.1.3 Attribute constraints

None.

###### 7.3a.2.2.1.4 Notifications

The common notifications defined in clause 7.6 are valid for this IOC, without exceptions or additions.

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| **Next modified sections** |

## 7.5 Attribute definitions

### 7.5.1 Attribute properties

Table 7.5.1-1

| Attribute Name | Documentation and Allowed Values | Properties |
| --- | --- | --- |
| mLModelId | It identifies the ML model.  It is unique in each MnS producer.  allowedValues: N/A. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| candidateTrainingDataSource | It provides the address(es) of the candidate training data source provided by MnS consumer. The detailed training data format is vendor specific.  allowedValues: N/A. | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| aIMLInferenceName | It indicates the type of inference that the ML model supports.  allowedValues: the values of the MDA type (see 3GPP TS 28.104 [2]), Analytics ID(s) of NWDAF (see 3GPP TS 23.288 [3]), types of inference for NG-RAN e.g. (see TS 38.300 [16] and TS 38.401 [17]), and vendor's specific extensions. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| areConsumerTrainingDataUsed | It indicates whether the consumer provided training data have been used for the ML model training.  allowedValues: ALL, PARTIALLY, NONE. | type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| usedConsumerTrainingData | It provides the address(es) where lists of the consumer-provided training data are located, which have been used for the ML model training.  allowedValues: N/A. | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| trainingRequestRef | It is the DN(s) of the related MLTrainingRequest MOI(s).  allowedValues: DN. | type: DN  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| trainingProcessRef | It is the DN(s) of the related MLTrainingProcess MOI(s) that produced the MLTrainingReport.  allowedValues: DN. | type: DN  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| trainingReportRef | It is the DN of the MLTrainingReport MOI that represents the reports of the MLmodel training.  allowedValues: DN. | type: DN  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| lastTrainingRef | It is the DN of the MLTrainingReport MOI that represents the reports for the last training of the ML model.  allowedValues: DN. | type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| modelConfidenceIndication | It indicates the average confidence value (in unit of percentage) that the ML model would perform for inference on the data with the same distribution as training data.  Essentially, this is a measure of degree of the convergence of the trained ML model.  allowedValues: { 0..100 }. | type: integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| trainingRequestSource | It describes the model that requested to instantiate the MLTrainingRequest MOI.  This attribute can be of type String or DN. | type: <<CHOICE>>  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLTrainingRequest.requestStatus | It describes the status of a particular ML model training request.  allowedValues: NOT\_STARTED, IN\_PROGRESS, CANCELLING, SUSPENDED, FINISHED, and CANCELLED. | type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLTrainingProcessId | It identifies the training process.  It is unique in each instantiated process in the MnS producer.  allowedValues: N/A. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| priority | It indicates the priority of the training process.  The priority may be used by the ML model training to schedule the training processes. Lower value indicates a higher priority.  allowedValues: { 0..65535 }. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: 0  isNullable: False |
| terminationConditions | It indicates the conditions to be considered by the MLtraining MnS producer to terminate a specific training process.  allowedValues: N/A. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| progressStatus | It indicates the status of the process.  allowedValues: N/A. | type: ProcessMonitor  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLUpdateProcess.cancelProcess | It allows the ML update MnS consumer to cancel the ML update process.  Setting this attribute to "TRUE" cancels the ML update process. Setting the attribute to "FALSE" has no observable result. Default value is set to "FALSE".    allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| mLupdateProcess.suspendProcess | It allows the ML update MnS consumer to suspend the ML update process.  Setting this attribute to "TRUE" suspends the ML update process. The process can be resumed by setting this attribute to “FALSE” when it is suspended. Setting the attribute to "FALSE" has no observable result. Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| mLModelVersion | It indicates the version number of the ML model.  allowedValues: N/A. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| performanceRequirements | It indicates the expected performance for a trained ML model when performing on the training data.  allowedValues: N/A. | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| modelPerformanceTraining | It indicates the performance score of the ML model when performing on the training data.  allowedValues: N/A. | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| mLTrainingProcess.progressStatus.progressStateInfo | It provides the following specialization for the “progressStateInfo“ attribute of the “ProcessMonitor“ data type for the “MLTrainingProcess.progressStatus“.  When the ML model training is in progress, and the " mLTrainingProcess.progressStatus.status " is equal to "RUNNING", it provides the more detailed progress information.  allowedValues for " mLTrainingProcess.progressStatus.status " = "RUNNING":  - “COLLECTING\_DATA”  - “PREPARING\_TRAINING\_DATA”  - “TRAINING” + DN of the MLModel being trained  The allowed values for " mLTrainingProcess.progressStatus.status " = "CANCELLING" are vendor specific.  The allowed values for " mLTrainingProcess.progressStatus.status " = "NOT\_STARTED" are vendor specific. | Type: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| inferenceOutputName | It indicates the name of an inference output of an ML model.  allowedValues: the name of the MDA output IEs (see 3GPP TS 28.104 [2]), name of analytics output IEs of NWDAF (see TS 23.288 [3]), RAN inference output IE name(s), and vendor's specific extensions. | Type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| performanceMetric | It indicates the performance metric used to evaluate the performance of an ML model, e.g. "accuracy", "precision", "F1 score", etc.  allowedValues: N/A. | Type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| performanceScore | It indicates the performance score (in unit of percentage) of an ML model when performing inference on a specific data set (Note).  The performance metrics may be different for different kinds of ML models depending on the nature of the model. For instance, for numeric prediction, the metric may be accuracy; for classification, the metric may be a combination of precision and recall, like the "F1 score".  allowedValues: { 0..100 }. | Type: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLTrainingRequest.cancelRequest | It allows the ML training MnS consumer to cancel the ML model training request.  Setting this attribute to "TRUE" cancels the ML model training request. The request can be resumed by setting this attribute to "FALSE" when it is suspended. Cancellation is possible when the requestStatus is the "NOT\_STARTED", " IN\_PROGRESS", and "SUSPENDED" state. Setting the attribute to "FALSE" has no observable result.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| MLTrainingRequest.suspendRequest | It allows the ML training MnS consumer to suspend the ML model training request.  Setting this attribute to "TRUE" suspends the ML model training process. Suspension is possible when the requestStatus is not the "FINISHED" state. Setting the attribute to "FALSE" has no observable result.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| MLTrainingProcess.cancelProcess | It allows the ML training MnS consumer to cancel the ML model training process.  Setting this attribute to “TRUE“ cancels the ML model training process. Cancellation is possible when the “mLTrainingProcess.progressStatus.status“ is not the “FINISHED“ state. Setting the attribute to “FALSE“ has no observable result.  Default value is set to “FALSE“.  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| MLTrainingProcess.suspendProcess | It allows the ML training MnS consumer to suspend the ML model training process.  Setting this attribute to "TRUE" suspends the ML model training process. The process can be resumed by setting this attribute to “FALSE” when it is suspended. Suspension is possible when the " mLTrainingProcess.progressStatus.status" is not the "FINISHED", "CANCELLING" or "CANCELLED" state. Setting the attribute to "FALSE" has no observable result.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| inferenceModelRef | It describes the target entities that will use the ML model for inference. | Type: DN  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| dataProviderRef | It describes the entities that have provided or should provide data needed by the ML model e.g. for training or inference | Type: DN  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| areNewTrainingDataUsed | It indicates whether the other new training data have been used for the ML model training.  allowedValues: TRUE, FALSE. | type: Boolean  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| trainingDataQualityScore | It indicates numerical value that represents the dependability/quality of a given observation and measurement type. The lowest value indicates the lowest level of dependability of the data, i.e. that the data is not usable at all.  allowedValues: { 0..100 }. | Type: Real  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| decisionConfidenceScore | It is the numerical value that represents the dependability/quality of a given decision generated by the AI/ML inference function. The lowest value indicates the lowest level of dependability of the decisions, i.e. that the data is not usable at all.  allowedValues: { 0..100 }. | Type: Real  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| expectedRuntimeContext | This describes the context where an MLModel is expected to be applied.  allowedValues: N/A | Type: MLContext  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| trainingContext | This specifies the context under which the MLModel has been trained.  allowedValues: N/A | Type: MLContext  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| runTimeContext | This specifies the context where the MLmodel or model is being applied.  allowedValues: N/A | Type: MLContext  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLTrainingRequest.mLModelRef | It identifies the DN of the MLModel requested to be trained.  allowedValues: DN | Type: DN  multiplicity: 0..1  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| MLTrainingReport. mLModelGeneratedRef | It identifies the DN of the MLModel generated by the ML training.  allowedValues: DN | Type: DN  multiplicity: 1  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| mLModelRepositoryRef | It identifies the DN of the MLModelRepository. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLRepositoryId | It indicates the unique ID of the ML repository. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| modelPerformanceValidation | It indicates the performance score of the ML model when performing on the validation data.  allowedValues: N/A | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| dataRatioTrainingAndValidation | It indicates the ratio (in terms of quantity of data samples) of the training data and validation data used during the training and validation process. It is represented by the percentage of the validation data samples in the total training data set (including both training data samples and validation data samples). The value is an integer reflecting the rounded number of percent \* 100.    allowedValues: { 0 .. 100 }. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLTestingRequest.requestStatus | It describes the status of a particular ML testing request.  allowedValues: NOT\_STARTED, IN\_PROGRESS, CANCELLING, SUSPENDED, FINISHED, and CANCELLED. | type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLTestingRequest.cancelRequest | It allows the ML testing MnS consumer to cancel the ML testing request.  Setting this attribute to "TRUE" cancels the ML testing request. Cancellation is possible when the requestStatus is the "NOT\_STARTED", " IN\_PROGRESS", and "SUSPENDED" state. Setting the attribute to "FALSE" has no observable result.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| MLTestingRequest.suspendRequest | It allows the ML testing MnS consumer to suspend the ML testing request.  Setting this attribute to "TRUE" suspends the ML testing request. The request can be resumed by setting this attribute to “FALSE” when it is suspended. Suspension is possible when the requestStatus is not the "FINISHED" state. Setting the attribute to "FALSE" has no observable result.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| MLTestingRequest.mLModelRef | It identifies the DN of the MLModel requested to be tested.  AllowedValues: DN | Type: DN  Multiplicity: 0..1  isOrdered: Falso  isUnique: True  defaultValue: None  isNullable: True |
| modelPerformanceTesting | It indicates the performance score of the ML model when performing on the testing data.  allowedValues: N/A. | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| mLTestingResult | It provides the address where the testing result (including the inference result for each testing data example) is provided.  The detailed testing result format is vendor specific.  allowedValues: N/A. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| testingRequestRef | It identifies the DN of the MLTestingRequest MOI.  allowedValues: DN | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| supportedPerformanceIndicators | This parameter lists specific PerformanceIndicator(s) of an ML model.  allowedValues: N/A. | type: SupportedPerfIndicator  multiplicity: 1..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| performanceIndicatorName | It indicates the identifier of the specific performance indicator.  allowedValues: N/A | type: string  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| isSupportedForTraining | It indicates whether the specific performance indicator is supported a performance metric of ML model training for the ML model Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | type: Boolean  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| isSupportedForTesting | It indicates whether the specific performance indicator is supported a performance metric of ML model testing for the ML model.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | type: Boolean  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| mLUpdateProcessRef | It is the DN of the mLUpdateProcess MOI that represents the process of updating an ML model.  allowedValues: DN. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLUpdateRequestRef | It is the DN of the MLUpdateRequest MOI that represents an  ML update request.  allowedValues: DN. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLUpdateReportRef | It is the DN of the MLUpdateReport MOI that represents an ML update report.  allowedValues: DN. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLUpdateReportingPeriod | It specifies the time duration upon which the MnS consumer expects the ML update is reported. | Type: TimeWindow  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| availMLCapabilityReport | It represents the available ML capabilities.  allowedValues: N/A. | Type: AvailMLCapabilityReport multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| UpdatedMLCapability | It represents the updated ML capabilities.  allowedValues: N/A. | Type: AvailMLCapabilityReport multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| availMLCapabilityReportID | It identifies the available ML capability report.  allowedValues: N/A. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| newCapabilityVersionId | It indicates the specific version of AI/ML capabilities to be applied for the update. It is typically the one indicated by the MLCapabilityVersionID in a newCapabilityVersion | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| mlCapabilityVersionId | It indicates the version of ML capabilities that is available for the update. | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| performanceGainThreshold | It defines the minimum performance gain as a percentage that shall be achieved with the capability update, i.e., the difference in the performances between the existing capabilities and the new capabilities should be at least performanceGainThreshold otherwise the new capabilities should not be applied.  Allowed value: float between 0.0 and 100.0 | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| expectedPerformanceGains | It indicates the expected performance gain if/when the AI/ML capabilities of the respective network function are updated with/to the specific set of newly available AI/ML capabilities. | Type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| updateTimeDeadline | It indicates the maximum as stated in the MLUpdate request that should be taken to complete the update | Type: TimeWindow  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLUpdateReport.mLModelModelRef | It indicates the DN of MLModel instances that can be updated. | Type: DN  multiplicity: 1 .. \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| MLUpdateRequest.requestStatus | It describes the status of a particular ML update request.  allowedValues: NOT\_STARTED, IN\_PROGRESS, CANCELLING, SUSPENDED, FINISHED, and CANCELLED. | Type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLUpdateRequest.cancelRequest | It allows the MnS consumer to cancel the ML update request.  Setting this attribute to "TRUE" cancels the ML update request. Cancellation is possible when the requestStatus is the "NOT\_STARTED", " IN\_PROGRESS", and "SUSPENDED" state. Setting the attribute to "FALSE" has no observable result.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| MLUpdateRequest.suspendRequest | It allows the MnS consumer to suspend the ML update request.  Setting this attribute to "TRUE" suspends the ML update request. The request can be resumed by setting this attribute to “FALSE” when it is suspended. Suspension is possible when the requestStatus is not the "FINISHED" state. Setting the attribute to "FALSE" has no observable result.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| memberMLModelRefList | It identifies the list of member ML models within a level of an ML model coordination group.  allowedValues: DN list | Type: DN  multiplicity: 2..\*  isOrdered: True  isUnique: True  defaultValue: None  isNullable: False |
| MLTrainingRequest.mLModelCoordinationGroupRef | It identifies the DN of the MlModelCoordinationGroup requested to be trained.  allowedValues: DN | Type: DN  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLTrainingReport.mLModelCoordinationGroupGeneratedRef | It identifies the DN of the MLModelCoordinationGroup generated by ML training.  AllowedValues: DN | Type: DN  multiplicity: 1..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| MLTestingRequest.mLModelCoordinationGroupRef | It identifies the DN of the MLEntityCoordinationGroup requested to be tested.  AllowedValues: DN | Type: DN  multiplicity: 1..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| retrainingEventsMonitorRef | It indicates the DN of the ThresholdMonitor MOI that indicates the performance measurements and its corresponding thresholds to be used by MnS producer to initiate the re-training of the MLModel. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| sourceTrainedMLModelRef | It identifies the DN of the source trained MLModel whose copy has been loaded from the ML model repository to the inference function.  allowedValues: DN | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| MLModelLoadingRequest.requestStatus | It describes the status of a particular ML model loading request.  allowedValues: NOT\_STARTED, IN\_PROGRESS, CANCELLING, SUSPENDED, FINISHED, and CANCELLED. | type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLModelLoadingRequest.cancelRequest | It allows the MnS consumer to cancel the ML model loading request.  Setting this attribute to "TRUE" cancels the ML model loading. Cancellation is possible when the requestStatus is the "NOT\_STARTED", " IN\_PROGRESS", and "SUSPENDED" state. Setting the attribute to "FALSE" has no observable result.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| MLModelLoadingRequest.suspendRequest | It allows the MnS consumer to suspend the ML model loading request.  Setting this attribute to "TRUE" suspends the ML model loading request. The request can be resumed by setting this attribute to “FALSE” when it is suspended. Suspension is possible when the requestStatus is not the "FINISHED" state. Setting the attribute to "FALSE" has no observable result.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| mLModelToLoadRef | It identifies the DN of a trained MLModel requested to be loaded to the target inference function(s). | Type: DN  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| policyForLoading | It provides the policy for controlling ML model loading triggered by the MnS producer.  This policy contains two thresholds in the thresholdList attribute. The first threshold is related to the ML model to be loaded, and the second threshold is related to the existing ML model being used for inference. | Type: AIMLManagementPolicy  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| thresholdList | It provides the list of threshold. | Type: ThresholdInfo  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| MLModelLoadingProcess.progressStatus.progressStateInfo | It provides the following specialization for the "progressStateInfo" attribute of the "ProcessMonitor" data type for the "MLModelLoadingProcess.progressStatus".  When the ML model loading is in progress, and the " MLModelLoadingProcess.progressStatus.status " is equal to "RUNNING", it provides the more detailed progress information.  allowedValues for " MLModelLoadingProcess.progressStatus.status " = "RUNNING":  The allowed values for " MLModelLoadingProcess.progressStatus.status " = "CANCELLING" are vendor specific.  The allowed values for " MLModelLoadingProcess.progressStatus.status " = "NOT\_STARTED" are vendor specific. | Type: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLModelLoadingProcess.cancelProcess | It allows the MnS consumer to cancel the ML model loading process.  Setting this attribute to "TRUE" cancels the process. Cancellation is possible when the "MLModelLoadingProcess.progressStatus.status" is not the "FINISHED" state. Setting the attribute to "FALSE" has no observable result.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| MLModelLoadingProcess.suspendProcess | It allows the MnS consumer to suspend the ML model loading process.  Setting this attribute to "TRUE" suspends the process. The process can be resumed by setting this attribute to "FALSE" when it is suspended. Suspension is possible when the "MLModelLoadingProcess.progressStatus.status" is not the "FINISHED", "CANCELLING" or "CANCELLED" state. Setting the attribute to "FALSE" has no observable result.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | Type: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| MLModelLoadingRequestRef | It identifies the DN of the associated MLModelLoadingRequest.  allowedValues: DN. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| MLModelLoadingPolicyRef | It identifies the DN of the associated MLModelLoadingPolicyRef.  allowedValues: DN. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| LoadedMLModelRef | It identifies the DN of the MLModel that has been loaded to the inference function.  allowedValues: DN | Type: DN  multiplicity: 1  isOrdered: Fa N/A lse  isUnique: N/A  defaultValue: None  isNullable: True |
| activationStatus | It describes the activation status.  allowedValues: ACTIVATED, DEACTIVATED. | Type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| AIMLManagementPolicy.managedActivationScope | It provides a list of sub scopes for which ML inference is activated as triggered by a policy on the MnS producer. For example, the sub scopes may be a list of cells or of geographical areas. The list is an ordered list indicating the inference is activated for the first sub scope and gradually extended to the next sub scope if the policy evaluates to true.  allowedValues: N/A | Type: ManagedActivationScope  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| AIMLInferenceFunction.managedActivationScope | It provides a list of sub scopes for which ML inference is activated as triggered by a policy on the MnS producer. For example, the sub scopes may be a list of cells or of geographical areas. The list is an ordered list indicating the inference is activated for the first sub scope and gradually extended to the next sub scope if the policy evaluates to true.  allowedValues: N/A | Type: AIMLManagementPolicy  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| ManagedActivationScope.dNList | It indicates the list of DN, the list is an ordered list indicating the inference is activated for the first sub scope and gradually extended to the next sub scope.  allowedValues: N/A | Type: DN  multiplicity: \*  isOrdered: True  isUnique: True  defaultValue: None  isNullable: False |
| ManagedActivationScope.timeWindow | It indicates the list of time window; the list is an ordered list indicating the inference is activated for the first sub scope and gradually extended to the next sub scope.  allowedValues: N/A | Type: TimeWindow  multiplicity: \*  isOrdered: True  isUnique: True  defaultValue: None  isNullable: False |
| ManagedActivationScope.geoPolygon | It indicates the list of GeoArea, the list is an ordered list indicating the inference is activated for the first sub scope and gradually extended to the next sub scope.  allowedValues: N/A | Type: GeoArea  multiplicity: \*  isOrdered: True  isUnique: True  defaultValue: None  isNullable: False |
| usedByFunctionRefList | It provides the DNs of the functions supported by the AIMLInferenceFunction.  allowedValues: N/A | Type: DN  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| inferenceOutputId | It identifies an inference output within an AIMLinferenceReport. | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| inferenceOutputs | It indicates the Outputs that have been derived by the AIMLInferenceFunction instance from a specific ML model.  Each ML model, inferenceOutputs may be a set of values.  allowedValues: N/A. | type: InferenceOutput  multiplicity: 1..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| inferencePerformance | It indicates the performance score of the ML model during Inference.  allowedValues: N/A. | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| inferenceOutputTime | It indicates the time at which the inference output is generated.  allowedValues: N/A | Type: DateTime  multiplicity: \*  isOrdered: True  isUnique: True  defaultValue: None  isNullable: False |
| outputResult | It indicates the result of an inference. | type: AttributeValuePair  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: Null  isNullable: False |
| mLCapabilitiesInfoList | It indicates information about what an ML model can generate inference for.  allowedValues: N/A. | type: MLCapabilityInfo  multiplicity: 1..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| capabilityName | It indicates the name of a capability for which an ML model can generate inference. The capability is defined by Mns producer which can be traffic analysis capability, coverage analysis capability, mobility analysis capability or vendor specific extensions.  allowedValues: N/A. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLCapabilityParameters | It indicates a set of optional parameters that apply for an aIMLInferenceName and capabilityName.  allowedValues: N/A | Type: AttributeValuePair  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| NOTE: When the performanceScore is to indicate the performance score for ML model training, the data set is the training data set. When the performanceScore is to indicate the performance score for ML validation, the data set is the validation data set. When the performanceScore is to indicate the performance score for ML model testing, the data set is the testing data set. | | |

|  |
| --- |
| **Next modified sections** |

Forge MR link: <https://forge.3gpp.org/rep/sa5/MnS/-/merge_requests/1304> at commit fb9b3df0b996843d7e04986598e80fb1c4c24d38

\*\*\* START OF CHANGE 1 \*\*\*

\*\*\* OpenAPI/TS28105\_AiMlNrm.yaml \*\*\*

<CODE BEGINS>

openapi: 3.0.1

info:

title: AI/ML NRM

version: 18.4.0

description: >-

OAS 3.0.1 specification of the AI/ML NRM

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externalDocs:

description: 3GPP TS 28.105; AI/ML Management

url: http://www.3gpp.org/ftp/Specs/archive/28\_series/28.105/

paths: {}

components:

schemas:

#-------- Definition of types-----------------------------------------------------

MLContext:

type: object

properties:

inferenceModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

dataProviderRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

RequestStatus:

type: string

enum:

- NOT\_STARTED

- IN\_PROGRESS

- SUSPENDED

- FINISHED

- CANCELLED

- CANCELLING

ModelPerformance:

type: object

properties:

inferenceOutputName:

type: string

performanceMetric:

type: string

performanceScore:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Float'

decisionConfidenceScore:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Float'

ProcessMonitor:

description: >-

This data type is the "ProcessMonitor" data type defined in “genericNrm.yaml”

with specialisations for usage in TS 28.105.

type: object

properties:

status:

type: string

progressPercentage:

type: integer

minimum: 0

maximum: 100

progressStateInfo:

type: string

resultStateInfo:

type: string

AIMLManagementPolicy:

description: >-

This data type represents the properties of a policy for AI/ML management.

type: object

properties:

thresholdList:

type: array

items:

$ref: 'TS28623\_ThresholdMonitorNrm.yaml#/components/schemas/ThresholdInfo'

managedActivationScope:

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

SupportedPerfIndicator:

type: object

properties:

performanceIndicatorName:

type: string

isSupportedForTraining:

type: boolean

isSupportedForTesting:

type: boolean

ManagedActivationScope:

oneOf:

- type: object

properties:

dNList:

type: array

items:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

- type: object

properties:

timeWindow:

type: array

items:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/TimeWindow'

- type: object

properties:

geoPolygon:

type: array

items:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/GeoArea'

MLCapabilityInfo:

type: object

properties:

aIMLInferenceName:

type: string

capabilityName:

type: string

mLCapabilityParameters:

description: A map (list of key-value pairs) for an aIMLInferenceName and capabilityName

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/AttributeNameValuePairSet'

AvailMLCapabilityReport:

type: object

properties:

availMLCapabilityReportID:

type: string

mLCapabilityVersionId:

type: array

items:

type: string

expectedPerformanceGains:

type: array

items:

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

mLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

InferenceOutput:

type: object

properties:

inferenceOutputId:

type: array

items:

type: string

aIMLInferenceName:

type: string

inferenceOutputTime:

type: array

items:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DateTime'

# FIXME, isOrder/isUnique both as True

inferencePerformance:

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

outputResult:

description: A map (list of key-value pairs) for Inference result name and it's value

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/AttributeNameValuePairSet'

#-------- Definition of types for name-containments ------

SubNetwork-ncO-AiMlNrm:

type: object

properties:

MLTrainingFunction:

$ref: '#/components/schemas/MLTrainingFunction-Multiple'

MLTestingFunction:

$ref: '#/components/schemas/MLTestingFunction-Multiple'

MLModelRepository:

$ref: '#/components/schemas/MLModelRepository-Multiple'

MLUpdateFunction:

$ref: '#/components/schemas/MLUpdateFunction-Multiple'

AIMLInferenceFunction:

$ref: '#/components/schemas/AIMLInferenceFunction-Multiple'

AIMLInferenceEmulationFunction:

$ref: '#/components/schemas/AIMLInferenceEmulationFunction-Multiple'

ManagedElement-ncO-AiMlNrm:

type: object

properties:

MLTrainingFunction:

$ref: '#/components/schemas/MLTrainingFunction-Multiple'

MLTestingFunction:

$ref: '#/components/schemas/MLTestingFunction-Multiple'

MLModelRepository:

$ref: '#/components/schemas/MLModelRepository-Multiple'

MLUpdateFunction:

$ref: '#/components/schemas/MLUpdateFunction-Multiple'

AIMLInferenceFunction:

$ref: '#/components/schemas/AIMLInferenceFunction-Multiple'

AIMLInferenceEmulationFunction:

$ref: '#/components/schemas/AIMLInferenceEmulationFunction-Multiple'

#-------- Definition of concrete IOCs --------------------------------------------

MLTrainingFunction-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-Attr'

- type: object

properties:

mLModelRepositoryRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-ncO'

- type: object

properties:

MLTrainingRequest:

$ref: '#/components/schemas/MLTrainingRequest-Multiple'

MLTrainingProcess:

$ref: '#/components/schemas/MLTrainingProcess-Multiple'

MLTrainingReport:

$ref: '#/components/schemas/MLTrainingReport-Multiple'

ThresholdMonitors:

$ref: 'TS28623\_ThresholdMonitorNrm.yaml#/components/schemas/ThresholdMonitor-Multiple'

MLTestingRequest:

$ref: '#/components/schemas/MLTestingRequest-Multiple'

MLTestingReport:

$ref: '#/components/schemas/MLTestingReport-Multiple'

MLTrainingRequest-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- type: object

properties:

aIMLInferenceName:

type: string

candidateTrainingDataSource:

type: array

items:

type: string

trainingDataQualityScore:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Float'

trainingRequestSource:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

requestStatus:

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

expectedRuntimeContext:

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

performanceRequirements:

type: array

items:

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

cancelRequest:

type: boolean

suspendRequest:

type: boolean

mLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

mLModelCoordinationGroupRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

MLTrainingProcess-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- type: object

properties:

priority:

type: integer

terminationConditions:

type: string

progressStatus:

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

cancelProcess:

type: boolean

suspendProcess:

type: boolean

trainingRequestRef: ## Figure 7.3a.1.1.1-1 has no such pointer

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

trainingReportRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

mLModelGeneratedRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

mLModelRef: ## Figure 7.3a.1.1.1-1 is 1-0..1 mapping, hence should be single

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

MLTrainingReport-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- type: object

properties:

usedConsumerTrainingData:

type: array

items:

type: string

modelConfidenceIndication:

type: integer

modelPerformanceTraining:

type: array

items:

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

modelPerformanceValidation:

type: array

items:

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

dataRatioTrainingAndValidation:

type: integer

areNewTrainingDataUsed:

type: boolean

trainingRequestRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

trainingProcessRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

lastTrainingRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

mLModelGeneratedRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

mLModelCoordinationGroupGeneratedRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

mLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

MLTestingFunction-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-Attr'

- type: object

properties: ##FIXME pointer to MLModelCoordinationGroup missing

mLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-ncO'

- type: object

properties:

MLTestingRequest:

$ref: '#/components/schemas/MLTestingRequest-Multiple'

MLTestingReport:

$ref: '#/components/schemas/MLTestingReport-Multiple'

MLTestingRequest-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- type: object

oneOf:

- required: [ requestStatus, mLModelToTestRef ]

- required: [ requestStatus, mLModelCoordinationGroupToTestRef ]

properties:

requestStatus:

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

cancelRequest:

type: boolean

suspendRequest:

type: boolean

mLModelToTestRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

mLModelCoordinationGroupToTestRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

MLTestingReport-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- type: object

properties:

modelPerformanceTesting:

type: array

items:

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

mLTestingResult:

type: string

testingRequestRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

MLModelLoadingRequest-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- type: object

properties:

requestStatus:

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

cancelRequest:

type: boolean

suspendRequest:

type: boolean

mLModelToLoadRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

MLModelLoadingPolicy-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- type: object

properties:

aIMLInferenceName:

type: string

policyForLoading:

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

mLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

MLModelLoadingProcess-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- type: object

properties:

progressStatus:

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

cancelProcess:

type: boolean

suspendProcess:

type: boolean

mLModelLoadingRequestRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

mLModelLoadingPolicyRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

loadedMLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

MLModel-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

mLModelId:

type: string

aIMLInferenceName:

type: string

mLModelVersion:

type: string

expectedRunTimeContext:

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

trainingContext:

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

runTimeContext:

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

supportedPerformanceIndicators:

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

mLCapabilitiesInfoList:

type: array

items:

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

retrainingEventsMonitorRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

sourceTrainedMLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

MLModelRepository-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

MLModel:

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

MLModelCoordinationGroup:

$ref: '#/components/schemas/MLModelCoordinationGroup-Multiple'

MLModelCoordinationGroup-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

memberMLModelRefList:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

## 7.3a.4.1 IOC

MLUpdateFunction-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-Attr'

- type: object

properties:

availMLCapabilityReport:

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

mLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-ncO'

- type: object

properties:

MLUpdateRequest:

$ref: '#/components/schemas/MLUpdateRequest-Multiple'

MLUpdateProcess:

$ref: '#/components/schemas/MLUpdateProcess-Multiple'

MLUpdateReport:

$ref: '#/components/schemas/MLUpdateReport-Multiple'

MLUpdateRequest-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

performanceGainThreshold:

type: array

items:

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

newCapabilityVersionId:

type: array

items:

type: string

updateTimeDeadline:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/TimeWindow'

requestStatus:

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

mLUpdateReportingPeriod:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/TimeWindow'

cancelRequest:

type: boolean

suspendRequest:

type: boolean

mLUpdateProcessRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

mLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

MLUpdateProcess-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

progressStatus:

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

mLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

mLUpdateRequestRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

mLUpdateReportRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

MLUpdateReport-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

type: object

properties:

updatedMLCapability:

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

mLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

mLUpdateProcessRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/Dn'

AIMLInferenceFunction-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-Attr'

- type: object

properties:

activationStatus:

type: string

enum:

- ACTIVATED

- DEACTIVATED

managedActivationScope:

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

usedByFunctionRefList:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

mLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-ncO'

- type: object

properties:

AIMLInferenceReport:

$ref: '#/components/schemas/AIMLInferenceReport-Multiple'

MLModelLoadingRequest:

$ref: '#/components/schemas/MLModelLoadingRequest-Multiple'

MLModelLoadingProcess:

$ref: '#/components/schemas/MLModelLoadingProcess-Multiple'

MLModelLoadingPolicy:

$ref: '#/components/schemas/MLModelLoadingPolicy-Multiple'

MLModel:

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

AIMLInferenceReport-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- type: object

properties:

inferenceOutputs:

type: array

items:

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

minItems: 1

mLModelRef:

$ref: 'TS28623\_ComDefs.yaml#/components/schemas/DnList'

AIMLInferenceEmulationFunction-Single:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/Top'

- type: object

properties:

attributes:

allOf:

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-Attr'

- type: object

properties:

AIMLInferenceReport:

$ref: '#/components/schemas/AIMLInferenceReport-Multiple'

- $ref: 'TS28623\_GenericNrm.yaml#/components/schemas/ManagedFunction-ncO'

#-------- Definition of JSON arrays for name-contained IOCs ----------------------

MLTrainingFunction-Multiple:

type: array

items:

$ref: '#/components/schemas/MLTrainingFunction-Single'

MLTrainingRequest-Multiple:

type: array

items:

$ref: '#/components/schemas/MLTrainingRequest-Single'

MLTrainingProcess-Multiple:

type: array

items:

$ref: '#/components/schemas/MLTrainingProcess-Single'

MLTrainingReport-Multiple:

type: array

items:

$ref: '#/components/schemas/MLTrainingReport-Single'

MLModel-Multiple:

type: array

items:

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

MLModelRepository-Multiple:

type: array

items:

$ref: '#/components/schemas/MLModelRepository-Single'

MLModelCoordinationGroup-Multiple:

type: array

items:

$ref: '#/components/schemas/MLModelCoordinationGroup-Single'

MLTestingFunction-Multiple:

type: array

items:

$ref: '#/components/schemas/MLTestingFunction-Single'

MLTestingRequest-Multiple:

type: array

items:

$ref: '#/components/schemas/MLTestingRequest-Single'

MLTestingReport-Multiple:

type: array

items:

$ref: '#/components/schemas/MLTestingRequest-Single'

MLModelLoadingRequest-Multiple:

type: array

items:

$ref: '#/components/schemas/MLModelLoadingRequest-Single'

MLModelLoadingProcess-Multiple:

type: array

items:

$ref: '#/components/schemas/MLModelLoadingProcess-Single'

MLModelLoadingPolicy-Multiple:

type: array

items:

$ref: '#/components/schemas/MLModelLoadingPolicy-Single'

MLUpdateFunction-Multiple:

type: array

items:

$ref: '#/components/schemas/MLUpdateFunction-Single'

MLUpdateRequest-Multiple:

type: array

items:

$ref: '#/components/schemas/MLUpdateRequest-Single'

MLUpdateProcess-Multiple:

type: array

items:

$ref: '#/components/schemas/MLUpdateProcess-Single'

MLUpdateReport-Multiple:

type: array

items:

$ref: '#/components/schemas/MLUpdateReport-Single'

AIMLInferenceFunction-Multiple:

type: array

items:

$ref: '#/components/schemas/AIMLInferenceFunction-Single'

AIMLInferenceReport-Multiple:

type: array

items:

$ref: '#/components/schemas/AIMLInferenceReport-Single'

AIMLInferenceEmulationFunction-Multiple:

type: array

items:

$ref: '#/components/schemas/AIMLInferenceEmulationFunction-Single'

#-------- Definitions in TS 28.104 for TS 28.532 ---------------------------------

resources-AiMlNrm:

oneOf:

- $ref: '#/components/schemas/MLTrainingFunction-Single'

- $ref: '#/components/schemas/MLTrainingRequest-Single'

- $ref: '#/components/schemas/MLTrainingProcess-Single'

- $ref: '#/components/schemas/MLTrainingReport-Single'

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

- $ref: '#/components/schemas/MLModelRepository-Single'

- $ref: '#/components/schemas/MLModelCoordinationGroup-Single'

- $ref: '#/components/schemas/MLTestingFunction-Single'

- $ref: '#/components/schemas/MLTestingRequest-Single'

- $ref: '#/components/schemas/MLTestingReport-Single'

- $ref: '#/components/schemas/MLModelLoadingRequest-Single'

- $ref: '#/components/schemas/MLModelLoadingProcess-Single'

- $ref: '#/components/schemas/MLModelLoadingPolicy-Single'

- $ref: '#/components/schemas/MLUpdateFunction-Single'

- $ref: '#/components/schemas/MLUpdateRequest-Single'

- $ref: '#/components/schemas/MLUpdateProcess-Single'

- $ref: '#/components/schemas/MLUpdateReport-Single'

- $ref: '#/components/schemas/AIMLInferenceFunction-Single'

- $ref: '#/components/schemas/AIMLInferenceReport-Single'

- $ref: '#/components/schemas/AIMLInferenceEmulationFunction-Single'

<CODE ENDS>

\*\*\* END OF CHANGE 1 \*\*\*

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| --- |
| **End of modified sections** |