**3GPP TSG- Meeting #**

**Changsha, CN,15th – Revision of S5-241225**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  |  | **CR** |  **0094** | **rev** | **1** | **Current version:** |  |  |
|  |
| *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 correction of ML entity reference |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** | S5 |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | mLEntityRef is the DN of an MLEntity and is unique in all AI/ML phases. In this TS there are several attributes all referring to mLEntityRef, for example mLEntityToTrainRef, mLEntityToTestRef. Same is for MLEntityCoordinationGroup. It is enough to have a single attribute to refer to the DN of the MLEntityCoordinationGroup requested to be trained or tested. |
|  |  |
| ***Summary of change:*** | Replace all attribures that refer to mLEntityRef to the single attribute name which is mLEntityRef. Update the attribute property table. Create one attribute for reference to DN of the MLEntityCoordinationGroup.Same procedure is done for mLEntityGeneratedRef and mLEntityCoordinationGroupGeneratedRef |
|  |  |
| ***Consequences if not approved:*** | Having several attribute reffering to one and the same leads to a more complecated model and there is a risk for errors. |
|  |  |
| ***Clauses affected:*** | 7.3a.1.2.2.1, 7.3a.1.2.2.2, 7.3a.1.2.2.3, 7.3a.1.2.3.1, 7.3a.1.2.3.2, 7.3a.1.2.3.3, 7.3a.1.2.4.1, 7.3a.1.2.4.2, 7.3a.1.2.4.3, 7.3a.1.2.6.2, 7.3a.1.2.6.3, 7.5.1, B.2.1 |
|  |  |
|  | **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 S5-241227 |
|  |  |
| ***Other comments:*** | S5-240815 was approved in SA5#143 but not implemented. The prerequisite for this CR is that the re-submitted CR S5-241227 is approved.Forge MR link: <https://forge.3gpp.org/rep/sa5/MnS/-/merge_requests/1076> at commit 52295464073663f647985ece887326075363baa3 |
|  |  |
| ***This CR's revision history:*** |  |

***First change***

###### 7.3a.1.2.2.1 Definition

The IOC MLTrainingRequest represents the ML model training request that is created by the ML training MnS consumer.

The MLTrainingRequest MOI is contained under one MLTrainingFunction MOI.

The MLTrainingRequest MOI may represent the request for initial ML training or re-training. For ML re-training. The MLTrainingRequest is associated to one MLEntity or associated to one MLEntityCoordinationGroup.

The MLTrainingRequest may have a source to identify its origin, which may be used to prioritize the training resources for different sources. The sources may be for example the network functions, operator roles, or other functional differentiations.

Each MLTrainingRequest indicates the expectedRunTimeContext that describes the specific conditions for which the MLEntity should be trained.

In case the request is accepted, the ML training MnS producer decides when to start the ML training based on consumer requirements. Once the MnS producer decides to start the training based on the request, the ML training MnS producer instantiates one or more MLTrainingProcess MOI(s) that are responsible to perform the followings:

- collects (more) data for training, if the training data are not available or the data are available but not sufficient for the training;

- prepares and selects the required training data, with consideration of the consumer’s request provided candidate training data if any. The ML training MnS producer may examine the consumer's provided candidate training data and select none, some or all of them for training. In addition, the ML training MnS producer may select some other training data that are available in order to meet the consumer’s requirements for the MLentity training;

- trains the MLEntity using the selected and prepared training data.

The MLTrainingRequest may have a requestStatus field to represent the status of the specific MLTrainingRequest:

- The attribute values are "NOT\_STARTED", " IN\_PROGRESS", "SUSPENDED", "FINISHED", and "CANCELLED".

- When value turns to " IN\_PROGRESS", the ML training MnS producer instantiates one or more MLTrainingProcess MOI(s) representing the training process(es) being performed per the request and notifies the MLT MnS consumer(s) who subscribed to the notification.

When all of the training process associated to this request are completed, the value turns to "FINISHED".

***Next change***

###### 7.3a.1.2.2.2 Attributes

Table 7.3a.1.2.2.1-1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable  | isWritable | isInvariant | isNotifyable |
| inferenceType | CM | T | F | F | T |
| candidateTrainingDataSource | O | T | T | F | T |
| trainingDataQualityScore | O | T | T | F | T |
| trainingRequestSource | M | T | T | F | T |
| requestStatus | M | T | F | F | T |
| expectedRuntimeContext | M | T | T | F | T |
| performanceRequirements | M | T | T | F | T |
| cancelRequest | O | T | T | F | T |
| suspendRequest | O | T | T | F | T |
| **Attribute related to role** |  |  |  |  |  |
| mLEntityRef | CM | T | F | F | T |
| mLEntityCoordinationGroupRef | CM | T | F | F | T |

###### 7.3a.1.2.2.3 Attribute constraints

Table 7.3a.1.2.2.3-1

|  |  |
| --- | --- |
| Name | Definition |
| inferenceType Support Qualifier | Condition: MLTrainingRequest MOI represents the request for initial ML training.  |
|  |  |
|  |  |

***Next change***

##### 7.3a.1.2.3 MLTrainingReport

###### 7.3a.1.2.3.1 Definition

The IOC MLTrainingReport represents the ML model training report that is provided by the training MnS producer. The MLTrainingReport is associated with one MLEntity or one MLEntityCoordinationGroup.

The MLTrainingReport MOI is contained under one MLTrainingFunction MOI.

###### 7.3.1.2.3.2 Attributes

Table 7.3a.1.2.3.2-1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable  | isWritable | isInvariant | isNotifyable |
|  |  |  |  |  |  |
| areConsumerTrainingDataUsed | M | T | F | F | T |
| usedConsumerTrainingData | CM | T | F | F | T |
| modelConfidenceIndication | O | T | F | F | T |
| modelPerformanceTraining | M | T | F | F | T |
| modelPerformanceValidation | O | T | F | F | T |
| dataRatioTrainingAndValidation | O | T | F | F | T |
| areNewTrainingDataUsed | M | T | F | F | T |
| **Attribute related to role** |  |  |  |  |  |
| trainingRequestRef | CM | T | F | F | T |
| trainingProcessRef | M | T | F | F | T |
| lastTrainingRef | CM | T | F | F | T |
|  |  |  |  |  |  |
| mLEnityCoordinationGroupRef | CM | T | F | F | T |
| mLEntityRef | M | T | F | F | T |

###### 7.3a.1.2.3.3 Attribute constraints

Table 7.3a.1.2.3.3-1

|  |  |
| --- | --- |
| Name | Definition |
| usedConsumerTrainingData Support Qualifier | Condition: The value of areConsumerTrainingDataUsed attribute is ALL or PARTIALLY.  |
| trainingRequestRef Support Qualifier | Condition: The MLTrainingReport MOI represents the report for the ML model training that was requested by the MnS consumer (via MLTrainingRequest MOI). |
| lastTrainingRef Support Qualifier | Condition: The MLTrainingReport MOI represents the report for the ML model training that was not initial training (i.e. the model has been trained before). |
| mLEnityCoordinationGroupRef Support Qualifier | Condition: The MLTrainingReport MOI represents the report for a joint training of a group of ML entities. |

***Next change***

###### 7.3a.1.2.4.1 Definition

The IOC MLTrainingProcess represents the ML training process.

One MLTrainingProcess MOI may be instantiated for each MLTrainingRequest MOI or a set of MLTrainingRequest MOIs.

For each MLEntity under training, a MLTrainingProcess is instantiated, i.e. an MLTrainingProcess is associated with one MLEntity or one MLEntityCoordinationGroup.The MLTrainingProcess may be associated with one or more MLTrainingRequest MOI.

The MLTrainingProcess does not have to correspond to a specific MLTrainingRequest, i.e. a MLTrainingRequest does not have to be associated to a specific MLTrainingProcess. The MLTrainingProcess may be managed separately from the MLTrainingRequest MOIs, e.g. the MLTrainingRequest MOI may come from consumers which are network functions while the operator may wish to manage the MLTrainingProcess that is instantiated following the requests. Thus, the MLTrainingProcess may be associated to either one or more MLTrainingRequest MOI.

Each MLTrainingProcess instance needs to be managed differently from the related MLEntity, although the MLTrainingProcess may be associated to only one MLEntity. For example, the MLTrainingProcess may be triggered to start with a specific version of the MLEntity and multiple MLTrainingProcess instances may be triggered for different versions of the MLEntity. In either case the MLTrainingProcess instances are still associated with the same MLEntity but are managed separately from the MLEntity.

Each MLTrainingProcess has a priority that may be used to prioritize the execution of different MLTrainingProcess instances. By default, the priority of the MLTrainingProcess may be related in a 1:1 manner with the priority of the MLTrainingRequest for which the MLTrainingProcess is instantiated.

Each MLTrainingProcess may have one or more termination conditions used to define the points at which the MLTrainingProcess may terminate.

The "progressStatus" attribute represents the status of the ML model training and includes information the ML training MnS consumer can use to monitor the progress and results. The data type of this attribute is "ProcessMonitor" (see 3GPP TS 28.622 [12]). The following specializations are provided for this data type for the ML training process:

- The "status" attribute values are "RUNNING", "CANCELLING", "SUSPENDED", "FINISHED", and "CANCELLED". The other values are not used.

- The "timer" attribute is not used.

- When the "status" is equal to "RUNNING" the "progressStateInfo" attribute shall indicate one of the following states: "COLLECTING\_DATA", "PREPARING\_TRAINING\_DATA", "TRAINING".

- No specifications are provided for the "resultStateInfo" attribute. Vendor specific information may be provided though.

When the training is completed with "status" equal to "FINISHED", the MLT MnS producer provides the training report, by creating an MLTrainingReport MOI, to the MLT MnS consumer.

***Next change***

###### 7.3a.1.2.4.2 Attributes

Table 7.3a.1.2.4.2-1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable  | isWritable | isInvariant | isNotifyable |
|  |  |  |  |  |  |
| priority | M | T | T | F | T |
| terminationConditions | M | T | T | F | T |
| progressStatus | M | T | F | F | T |
| cancelProcess | O | T | T | F | T |
| suspendProcess | O | T | T | F | T |
| **Attribute related to role** |  |  |  |  |  |
| trainingRequestRef | CM | T | F | F | T |
| trainingReportRef | M | T | F | F | T |
|  |  |  |  |  |  |
| mLEntityRef | M | T | F | F | T |

###### 7.3a.1.2.4.3 Attribute constraints

Table 7.3a.1.2.4.3-1

|  |  |
| --- | --- |
| Name | Definition |
| trainingRequestRef Support Qualifier | Condition: The MLTrainingReport MOI represents the report for the ML model training that was requested by the training MnS consumer (via MLTrainingRequest MOI). |
|  |  |

***Next change***

###### 7.3a.1.2.6.2 Attributes

Table 7.3a.1.2.6.2-1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable  | isWritable | isInvariant | isNotifyable |
| requestStatus | M | T | F | F | T |
| cancelRequest | O | T | T | F | T |
| suspendRequest | O | T | T | F | T |
| **Attribute related to role** |  |  |  |  |  |
| mLEntityRef | CM | T | F | F | T |
| mLEntityCoordinationGroupRef | CM | T | F | F | T |

###### 7.3a.1.2.6.3 Attribute constraints

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |

Void

***Next change***

### 7.5.1 Attribute properties

Table 7.5.1-1

| Attribute Name | Documentation and Allowed Values | Properties |
| --- | --- | --- |
| mLEntityId | It identifies the ML entity.It is unique in each MnS producer.allowedValues: N/A. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: 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: Stringmultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| inferenceType | 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 RAN, and vendor's specific extensions. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: 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: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: 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: Stringmultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| trainingRequestRef | It is the DN(s) of the related MLTrainingRequest MOI(s).allowedValues: DN. | type: DN multiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: 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..1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| trainingReportRef | It is the DN of the MLTrainingReport MOI that represents the reports of the ML training.allowedValues: DN. | type: DN multiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: 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: 1isOrdered: N/AisUnique: N/AdefaultValue: 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: integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| trainingRequestSource | It describes the entity that requested to instantiate the MLTrainingRequest MOI.This attribute can be of type String or DN. | type: <<CHOICE>>multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| MLTrainingRequest.requestStatus | It describes the status of a particular ML training request.allowedValues: NOT\_STARTED, IN\_PROGRESS, CANCELLING, SUSPENDED, FINISHED, and CANCELLED. | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| mLTrainingProcessId | It identifies the training process.It is unique in each instantiated process in the MnS producer.allowedValues: N/A. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| priority | It indicates the priority of the training process.The priority may be used by the ML training to schedule the training processes. Lower value indicates a higher priority.allowedValues: { 0..65535 }. | type: integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: 0 isNullable: False |
| terminationConditions | It indicates the conditions to be considered by the MLtraining MnS producer to terminate a specific training process.allowedValues: MODEL UPDATED\_IN\_INFERENCE\_FUNCTION, INFERENCE FUNCTION\_TERMINATED, INFERENCE FUNCTION\_UPGRADED, INFERENCE\_CONTEXT\_CHANGED. | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| progressStatus | It indicates the status of the process.allowedValues: N/A. | type: ProcessMonitor multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| mLEntityVersion | It indicates the version number of the ML entity.allowedValues: N/A. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| performanceRequirements | It indicates the expected performance for a trained ML entity when performing on the training data.allowedValues: N/A. | type: ModelPerformancemultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| modelPerformanceTraining | It indicates the performance score of the ML entity when performing on the training data.allowedValues: N/A. | type: ModelPerformancemultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: 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 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 MLEntity being trainedThe allowed values for " mLTrainingProcess.progressStatus.status " = "CANCELLING" are vendor specific.The allowed values for " mLTrainingProcess.progressStatus.status " = "NOT\_STARTED" are vendor specific. | Type: Stringmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| inferenceOutputName | It indicates the name of an inference output of an ML entity.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: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| performanceMetric | It indicates the performance metric used to evaluate the performance of an ML entity, e.g. "accuracy", "precision", "F1 score", etc.allowedValues: N/A. | Type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| performanceScore | It indicates the performance score (in unit of percentage) of an ML entity 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: Realmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| MLTrainingRequest.cancelRequest | It indicates whether the ML training MnS consumer cancels the ML training request.Setting this attribute to "TRUE" cancels the ML 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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| MLTrainingRequest.suspendRequest | It indicates whether the ML training MnS consumer suspends the /ML training request.Setting this attribute to "TRUE" suspends the ML 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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| MLTrainingProcess.cancelProcess | It indicates whether the ML training MnS consumer cancels the ML training process.Setting this attribute to "TRUE" cancels the ML training request. 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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| MLTrainingProcess.suspendProcess | It indicates whether the ML training MnS consumer suspends the ML training process.Setting this attribute to "TRUE" suspends the ML 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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| inferenceEntityRef | It describes the target entities that will use the ML entity for inference. | Type: DN multiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| dataProviderRef | It describes the entities that have provided or should provide data needed by the ML entity e.g. for training or inference | Type: DN multiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| areNewTrainingDataUsed | It indicates whether the other new training data have been used for the ML model training.allowedValues: TRUE, FALSE. | type: Booleanmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: 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: Realmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: 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: Realmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| expectedRuntimeContext | This describes the context where an MLEntity is expected to be applied.allowedValues: N/A | Type: MLContextmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| trainingContext | This specify the context under which the MLEntity has been trained.allowedValues: N/A | Type: MLContextmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| runTimeContext | This specifies the context where the MLmodel or entity is being applied.allowedValues: N/A | Type: MLContextmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
|  |  |  |
|  |  |  |
| mLEntityRepositoryRef | It identifies the DN of the MLEntityRepository. | Type: DNmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| mLRepositoryId | It indicates the unique ID of the ML repository. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| modelPerformanceValidation | It indicates the performance score of the ML entity when performing on the validation data.allowedValues: N/A | type: ModelPerformancemultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: 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: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| mLEntityIdList | It identifies a list of ML entities.allowedValues: N/A. | type: Stringmultiplicity: \*isOrdered: N/AisUnique: TruedefaultValue: 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: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| MLTestingRequest.cancelRequest | It indicates whether the ML testing MnS consumer cancels 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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| MLTestingRequest.suspendRequest | It indicates whether the ML testing MnS consumer suspends 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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
|  |  |  |
| modelPerformanceTesting | It indicates the performance score of the ML entity when performing on the testing data.allowedValues: N/A. | type: ModelPerformancemultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: 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: Stringmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: True |
| testingRequestRef | It identifies the DN of the MLTestingRequest MOI.allowedValues: DN | Type: DNmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: True |
| supportedPerformanceIndicators | This parameter lists specific PerformanceIndicator(s) of an ML entity.allowedValues: N/A. | type: SupportedPerfIndicator multiplicity: 1..\*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| performanceIndicatorName | It indicates the identifier of the specific performance indicator.allowedValues: N/A | type: stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| isSupportedForTraining | It indicates whether the specific performance indicator is supported a performance metric of ML training for the ML entity Default value is set to "FALSE". allowedValues: TRUE, FALSE. | type: Booleanmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: FALSEisNullable: False |
| isSupportedForTesting | It indicates whether the specific performance indicator is supported a performance metric of ML testing for the ML entity. Default value is set to "FALSE". allowedValues: TRUE, FALSE. | type: Booleanmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: FALSEisNullable: False |
| mLUpdateProcessRef | It is the DN of the mLUpdateProcess MOI that represents the process of updating an ML entity.allowedValues: DN. | Type:multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| mLUpdateRequestRef | It is the DN of the MLUpdateRequest MOI that represents an ML update request.allowedValues: DN. | Type:multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| mLUpdateReportRef | It is the DN of the MLUpdateReport MOI that represents an ML update report.allowedValues: DN. | Type:multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| mLUpdateReportingPeriod | It specifies the time duration upon which the MnS consumer expects the ML update is reported. | Type: TimeWindowmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: NoneisNullable: False |
| availMLCapabilityReport | It represents the available ML capabilities.allowedValues: N/A. | Type: AvailMLCapabilityReport multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| UpdatedMLCapability | It represents the updated ML capabilities.allowedValues: N/A. | Type: AvailMLCapabilityReport multiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: 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: Stringmultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| mlCapabilityVersionId | It indicates the version of ML capabilities that is available for the update.  | type: Stringmultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: 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: ModelPerformancemultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: 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: ModelPerformancemultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: NoneisNullable: False |
| updateTimeDeadline | It indicates the maximum as stated in the MLUpdate request that should be taken to complete the update | Type: TimeWindowmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: NoneisNullable: False |
| mLEntityRef | It indicates the DN of MLEntity  | Type: DNmultiplicity: 1 .. \*isOrdered: FalseisUnique: TruedefaultValue: NoneisNullable: False |
| MLUpdateRequest.requestStatus | It describes the status of a particular ML update request.allowedValues: NOT\_STARTED, IN\_PROGRESS, CANCELLING, SUSPENDED, FINISHED, and CANCELLED. | Type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| MLUpdateRequest.cancelRequest | It indicates whether the MnS consumer cancels 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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| MLUpdateRequest.suspendRequest | It indicates whether the MnS consumer suspends 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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| memberMLEntityRefList | It identifies the list of member ML entities within a level of an ML entity coordination group.allowedValues: DN list | Type: DNmultiplicity: 2..\*isOrdered: TrueisUnique: TruedefaultValue: None isNullable: False |
| mLEntityCoordinationGroupRef | It identifies the DN of the MLEntityCoordinationGroup.allowedValues: DN | Type: DNmultiplicity: 0..1isOrdered: FalseisUnique: TruedefaultValue: 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 MLEntity. | Type: DNmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| sourceTrainedMLEntityRef | It identifies the DN of the source trained MLEntity whose copy has been loaded from the ML entity repository to the inference function. allowedValues: DN | Type: DNmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: True |
| MLEntityLoadingRequest.requestStatus | It describes the status of a particular ML entity loading request.allowedValues: NOT\_STARTED, IN\_PROGRESS, CANCELLING, SUSPENDED, FINISHED, and CANCELLED. | type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| MLEntityLoadingRequest.cancelRequest | It indicates whether the MnS consumer cancels the ML entity loading request.Setting this attribute to "TRUE" cancels the ML entity 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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| MLEntityLoadingRequest.suspendRequest | It indicates whether the MnS consumer suspends the ML entity loading request.Setting this attribute to "TRUE" suspends the ML entity 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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| mLEntityToLoadRef | It identifies the DN of a trained MLEntity requested to be loaded to the target inference function(s). | Type: DNmultiplicity: 0..1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: True |
| policyForLoading | It provides the policy for controlling ML entity loading triggered by the MnS producer.This policy contains two thresholds in the thresholdList attribute. The first threshold is related to the ML entity to be loaded, and the second threshold is related to the existing ML entity being used for inference. | Type: AIMLManagementPolicymultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: True |
| thresholdList | It provides the list of threshold.  | Type: ThresholdInfomultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: True |
| MLEntityLoadingProcess.progressStatus.progressStateInfo | It provides the following specialization for the "progressStateInfo" attribute of the "ProcessMonitor" data type for the "MLEntityLoadingProcess.progressStatus".When the ML loading is in progress, and the " MLEntityLoadingProcess.progressStatus.status " is equal to "RUNNING", it provides the more detailed progress information.allowedValues for " MLEntityLoadingProcess.progressStatus.status " = "RUNNING":The allowed values for " MLEntityLoadingProcess.progressStatus.status " = "CANCELLING" are vendor specific.The allowed values for " MLEntityLoadingProcess.progressStatus.status " = "NOT\_STARTED" are vendor specific. | Type: Stringmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: False |
| MLEntityLoadingProcess.cancelProcess | It indicates whether the MnS consumer cancels the ML entity loading process.Setting this attribute to "TRUE" cancels the process. Cancellation is possible when the "MLEntityLoadingProcess.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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| MLEntityLoadingProcess.suspendProcess | It indicates whether the MnS consumer suspends the ML entity 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 "MLEntityLoadingProcess.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: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| MLEntityLoadingRequestRef | It identifies the DN of the associated MLEntityLoadingRequest.allowedValues: DN. | Type: DNmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: True |
| MLEntityLoadingPolicyRef | It identifies the DN of the associated MLEntityLoadingPolicyRef.allowedValues: DN. | Type: DNmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: True |
| LoadedMLEntityRef | It identifies the DN of the MLEntity that has been loaded to the inference function. allowedValues: DN | Type: DNmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: True |
| activationStatus | It describes the activation status.allowedValues: ACTIVATED, DEACTIVATED. | Type: Enummultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| 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: ManagedActivationScopemultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: 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: DNmultiplicity: \*isOrdered: TrueisUnique: TruedefaultValue: 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: TimeWindowmultiplicity: \*isOrdered: TrueisUnique: TruedefaultValue: 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: GeoAreamultiplicity: \*isOrdered: TrueisUnique: TruedefaultValue: None isNullable: False |
| usedByFunctionRefList | It provides the DNs of the functions supported by the AIMLInferenceFunction.allowedValues: N/A | Type: DNmultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| inferenceOutputId  | It identifies an inference output within an AIMLinferenceReport. | type: Stringmultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| inferenceOutputs | It indicates the Outputs that have been derived by the AIMLInferenceFunction instance from a specific ML entity.Each ML entity, inferenceOutputs may be a set of values.allowedValues: N/A. | type: InferenceOutputmultiplicity:f 1..\*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| inferencePerformance | It indicates the performance score of the ML entity during Inference.allowedValues: N/A. | type: ModelPerformancemultiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| inferenceOutputTime | It indicates the time at which the inference output is generated.allowedValues: N/A | Type: DateTimemultiplicity: \*isOrdered: TrueisUnique: TruedefaultValue: None isNullable: False |
| outputResult | It indicates the result of an inference. | type: AttributeValuePairmultiplicity: \*isOrdered: FALSEisUnique: TRUEdefaultValue: NullisNullable: False |
| AIMLInferenceEmulationReportRefs | It indicates the DNs of set of reports generated on AIMLInferenceEmulationFunction. The AIMLInferenceEmulationReport has the same structure as the AIMLInferenceReport. allowedValues: N/A. | type: DN of AIMLInferenceReportmultiplicity: 1..\*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| mLCapabilitiesInfoList | It indicates information about what an ML entity can generate inference for. allowedValues: N/A. | type: MLCapabilityInfomultiplicity: 1..\*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| capabilityName | It indicates the name of a capability for which an ML entity can generate inference.allowedValues: N/A. | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| mLCapabilityParameters | It indicates a set of optional parameters that apply for an inferenceType and capabilityName. allowedValues: N/A | Type: AttributeValuePair multiplicity: \*isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| NOTE: When the performanceScore is to indicate the performance score for ML 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 testing, the data set is the testing data set. |

***Next change***

## B.2.1 OpenAPI document "TS28105\_AiMlNrm.yaml"

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

<CODE BEGINS>

openapi: 3.0.1

info:

 title: AI/ML NRM

 version: 18.3.0

 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:

 inferenceEntityRef:

 $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'

 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:

 inferenceType:

 type: string

 capabilityName:

 type: string

 mLCapabilityParameters:

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

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

 AvailMLCapabilityReport:

 type: object

 properties:

 mLCapabilityVersionId:

 type: array

 items:

 type: string

 expectedPerformanceGains:

 type: array

 items:

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

 mLEntityRef:

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

 InferenceOutput:

 type: object

 properties:

 inferenceOutputId:

 type: array

 items:

 type: string

 inferenceType:

 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'

 MLEntityRepository:

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

 MLUpdateFunction:

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

 AIMLInferenceFunction:

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

 ManagedElement-ncO-AiMlNrm:

 type: object

 properties:

 MLTrainingFunction:

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

 MLTestingFunction:

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

 MLEntityRepository:

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

 MLUpdateFunction:

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

 AIMLInferenceFunction:

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

 mLEntityRepositoryRef:

 $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'

 MLTrainingRequest-Single:

 allOf:

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

 - type: object

 properties:

 attributes:

 allOf:

 - type: object

 properties:

 inferenceType:

 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

 mLEntityRef:

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

 mLEntityCoordinationGroupRef:

 $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

 enum:

 - UPDATED\_IN\_INFERENCE\_FUNCTION

 - INFERENCE FUNCTION\_TERMINATED

 - INFERENCE FUNCTION\_UPGRADED

 - INFERENCE\_CONTEXT\_CHANGED

 progressStatus:

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

 cancelProcess:

 type: boolean

 suspendProcess:

 type: boolean

 trainingRequestRef:

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

 trainingReportRef:

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

 mLEntityRef:

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

 MLTrainingReport-Single:

 allOf:

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

 - type: object

 properties:

 attributes:

 allOf:

 - type: object

 properties:

 areConsumerTrainingDataUsed:

 type: string

 enum:

 - ALL

 - PARTIALLY

 - NONE

 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'

 mLEnityRef:

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

 mLEntityCoordinationGroupRef:

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

 mLEntityRef:

 $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:

 mLEntityRef:

 $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

 properties:

 requestStatus:

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

 cancelRequest:

 type: boolean

 suspendRequest:

 type: boolean

 mLEntityRef:

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

 mLEntityCoordinationGroupRef:

 $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'

 MLEntityLoadingRequest-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

 mLEntityToLoadRef:

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

 MLEntityLoadingPolicy-Single:

 allOf:

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

 - type: object

 properties:

 attributes:

 allOf:

 - type: object

 properties:

 inferenceType:

 type: string

 policyForLoading:

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

 mLEntityRef:

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

 MLEntityLoadingProcess-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

 resumeProcess:

 type: boolean

 MLEntityLoadingRequestRef:

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

 MLEntityLoadingPolicyRef:

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

 LoadedMLEntityRef:

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

 MLEntity-Single:

 allOf:

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

 - type: object

 properties:

 attributes:

 type: object

 properties:

 mLEntityId:

 type: string

 inferenceType:

 type: string

 mLEntityVersion:

 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'

 sourceTrainedMLEntityRef:

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

 MLEntityRepository-Single:

 allOf:

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

 - type: object

 properties:

 attributes:

 type: object

 properties:

 mLEntityRef:

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

 - type: object

 properties:

 MLEntity:

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

 MLEntityCoordinationGroup:

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

 MLEntityCoordinationGroup-Single:

 allOf:

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

 - type: object

 properties:

 attributes:

 type: object

 properties:

 memberMLEntityRefList:

 $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'

 mLEntityRef:

 $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'

 mLEntityRef:

 $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'

 mLEntityRef:

 $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'

 mLEntityRef:

 $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/ManagedActivationScope'

 usedByFunctionRefList:

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

 mLEntityRef: # FIXME S5-240805,S5-240917 both define here

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

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

 - type: object

 properties:

 AIMLInferenceReport:

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

 AIMLInferenceReport-Single:

 allOf:

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

 - type: object

 properties:

 attributes:

 allOf:

 - type: object

 properties:

 inferenceOutputs: #stage 2: attribute table name as: aimlInferenceOutputs FIXME

 type: array

 items:

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

 minItems: 1

 mLEntityRef:

 $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:

 AIMLInferenceEmulationReportRefs: # FIXME stage 2 of IOC AIMLInferenceEmulationReport missing

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

 - $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'

 MLEntity-Multiple:

 type: array

 items:

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

 MLEntityRepository-Multiple:

 type: array

 items:

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

 MLEntityCoordinationGroup-Multiple:

 type: array

 items:

 $ref: '#/components/schemas/MLEntityCoordinationGroup-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'

 MLEntityLoadingRequest-Multiple:

 type: array

 items:

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

 MLEntityLoadingProcess-Multiple:

 type: array

 items:

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

 MLEntityLoadingPolicy-Multiple:

 type: array

 items:

 $ref: '#/components/schemas/MLEntityLoadingPolicy-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/MLEntity-Single'

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

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

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

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

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

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

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

 - $ref: '#/components/schemas/MLEntityLoadingPolicy-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 \*\*\*

***End of changes***