**3GPP TSG-SA5 Meeting #154 *S5-241947***

Changsha, China, 15 - 19 April 2024

|  |
| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **28.105** | **CR** | **0124** | **rev** | **1** | **Current version:** | **18.3.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
|  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

|  |
| --- |
|  |
| ***Title:***  | Rel-18 CR TS 28.105 Correct issues of MLUpdateFunction |
|  |  |
| ***Source to WG:*** | ZTE Corporation |
| ***Source to TSG:*** | S5 |
|  |  |
| ***Work item code:*** | AIML\_MGT |  | ***Date:*** | 2024-04-01 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | cancelRequest and suspendRequest are used to cancel and suspend the ML update request. But corresponding attributes are missing in the MLUpdateProcess IOC. |
|  |  |
| ***Summary of change:*** | Add cancelRequest and suspendRequest in the MLUpdateProcess IOC. |
|  |  |
| ***Consequences if not approved:*** | It may cause inconsistence. |
|  |  |
| ***Clauses affected:*** | 7.3a.4.2.3, 7.5, 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 ...  |
|  |  |
| ***Other comments:*** | Forge Link: https://forge.3gpp.org/rep/sa5/MnS/-/commits/TS28.105\_Rel18\_CR0124\_Correct\_issues\_of\_MLUpdateFunction |
|  |  |
| ***This CR's revision history:*** | S5-241947 is the revision of S5-241584 |

***Start of First change***

##### 7.3a.4.2.3 MLUpdateProcess

###### 7.3a.4.2.3.1 Definition

This IOC represents the ML update process.

For each MLUpdateRequest to update the ML capabilities, the MLUpdateProcess is instantiated for the MLUpdateRequest unless the MLUpdateRequest is associated with an ongoing MLUpdateProcess if the MLUpdateProcess is updating the same MLEntity(s) as stated in the MLUpdateRequest i.e., the MLUpdateProcess is associated with at least one MLUpdateRequest. Relatedly, the MLUpdateProcess is associated with at least one MLEntity.

- Each MLUpdateProcess may have a status attribute (i.e., progressStatus) used to indicate progress status of theupdate process.

- The MLUpdateProcess has the capability of compiling and delivering reports and notifications relating to the ML update request or process.

- Each MLUpdateProcess may have attributes specifying the ML capability update reporting characteristics (e.g. periodically, after completion, etc.).

###### 7.3a.4.2.3.2 Attributes

The MLUpdateProcess IOC includes attributes inherited from Top IOC (defined in TS 28.622 [30]) and the following attributes:

Table 7.3a.4.2.3.2-1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
|  |  |  |  |  |  |
| cancelProcess | O | T | T | F | T |
| suspendProcess | O | T | T | F | T |
| progressStatus | M | T | T | F | T |
| **Attributes related to Role** |  |  |  |  |  |
| mLEntityRef | M | T | F | F | F |
| MLUpdateRequestRef | M | T | F | F | F |
| MLUpdateReportRef | M | T | F | F | F |

###### 7.3a.4.2.3.3 Attribute constraints

None.

###### 7.3a.4.2.3.4 Notifications

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

***End of First change***

***Start of Second change***

## 7.5 Attribute definitions

### 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 |
| mLUpdateProcess.cancelProcess | It indicates whether the ML update MnS consumer cancels the ML update process.Setting this attribute to "TRUE" cancels the ML update process. Default value is set to "FALSE". allowedValues: TRUE, FALSE. | Type: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: False |
| mLupdateProcess.suspendProcess | It indicates whether the ML update MnS consumer suspends 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. Default value is set to "FALSE". allowedValues: TRUE, FALSE. | Type: Booleanmultiplicity: 0..1isOrdered: N/AisUnique: N/AdefaultValue: FALSEisNullable: 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 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: 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 |
| mLEntityToTrainRef | It identifies the DN of the MLEntity requested to be trained.allowedValues: DN | Type: DNmultiplicity: 0..1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| mLEnityGeneratedRef | It identifies the DN of the MLEntity generated by the ML training.allowedValues: DN | Type: DNmultiplicity: 1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: 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 |
| mLEntityToTestRef | It identifies the DN of the MLEntity requested to be tested.allowedValues: DN | Type: DNmultiplicity: 0..1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: True |
| 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 list of references to MLEntity instances that can be updated. | 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 |
| mLEntityCoordinationGroupToTrainRef | It identifies the DN of the MlEntityCoordinationGroup requested to be trained.allowedValues: DN | Type: DNmultiplicity: 0..1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| mLEnityCoordinationGroupGeneratedRef | It identifies the DN of the MlEntityCoordinationGroup generated by the ML training.allowedValues: DN | Type: DNmultiplicity: 0..1isOrdered: FalseisUnique: TruedefaultValue: None isNullable: False |
| mLEntityCoordinationGroupToTestRef | It identifies the DN of the MlEntityCoordinationGroup requested to be tested.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: 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. |

### 7.5.2 Constraints

None.

***End of Second change***

***Start of Third change***

Annex B (normative):
OpenAPI definition of the AI/ML NRM

# B.1 General

This annex contains the OpenAPI definition of the AI/ML NRM in YAML format.

The information models of the AI/ML NRM are defined in clause 7.

Mapping rules to produce the OpenAPI definition based on the information model are defined in 3GPP TS 32.160 [14].

# B.2 Solution Set (SS) definitions

## B.2.1 OpenAPI document "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

 © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

 All rights reserved.

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 âœgenericNrm.yamlâ

 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

 mLEntityToTrainRef:

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

 mLEntityCoordinationGroupToTrainRef:

 $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'

 mLEnityGeneratedRef:

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

 mLEntityCoordinationGroupGeneratedRef:

 $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

 mLEntityToTestRef:

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

 mLEntityCoordinationGroupToTestRef:

 $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:

 cancelProcess:

 type: boolean

 suspendProcess:

 type: boolean 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 Third change***