**3GPP TSG-SA5 Meeting #155 *S5-243334***

**Jeju, South Korea, 27 - 31 May 2024**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **28.105** | **CR** | **Input to draftCR** | **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)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

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|  | | | | | | | | | | |
| ***Title:*** | Rel-18 Input to draftCR TS 28.105 Update AIMLInferenceEmulationFunction IOC | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | AIML\_MGT | | | | |  | ***Date:*** | | | 2024-04-29 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | * There is no definition of attribute “aIMLInferenceEmulationFunctionId” in clause 7.5.1. In addition, this IOC can be identified by DN, no need to define Id. * Change the “AIMLInferenceEmulationReport” to “AIMLInferenceReport” in Figure 7.3a.2.1.1-1 and Figure 7.3a.2.1.2-1, because the Emulation report is reuse the inference report according to the current definition, so the attribute of “aIMLInferenceEmulationReportRefList” should remove. | | | | | | | | |
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| ***Summary of change:*** | | * Remove the attribute “aIMLInferenceEmulationFunctionId” and add some clarification descriptions. * Change the “AIMLInferenceEmulationReport” to “AIMLInferenceReport” in Figure 7.3a.2.1.1-1 and Figure 7.3a.2.1.2-1. * Remove “aIMLInferenceEmulationReportRefList” in clause 7.5.1 | | | | | | | | |
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| ***Consequences if not approved:*** | | It is unclear of management of ML emulation. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.3a.2.1.1, 7.3a.2.1.2, 7.3a.2.2.1.2, 7.5.1, A.14, A.15 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| **1st change** |

### 7.3a.2 Information model definitions for ML emulation Phase

#### 7.3a.2.1 Class diagram

##### 7.3a.2.1.1 Relationships

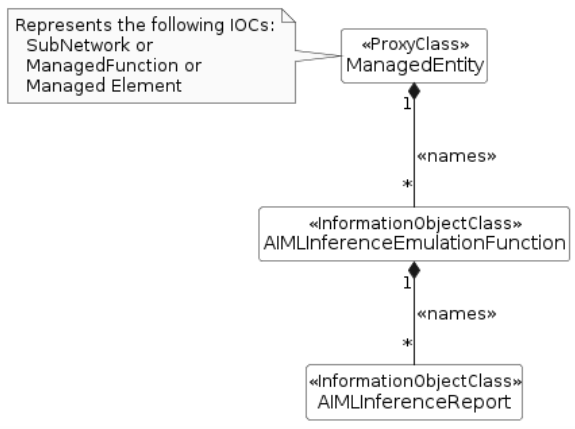


Figure 7.3a.2.1.1-1: NRM fragment for AI/ML inference emulation Control

##### 7.3a.2.1.2 Inheritance

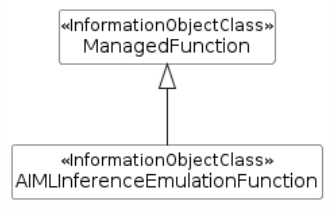


Figure 7.3a.2.1.2-1: AI/ML inference emulation Inheritance Relations

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| **Next change** |

#### 7.3a.2.2 Class definitions

##### 7.3a.2.2.1 AIMLInferenceEmulationFunction

###### 7.3a.2.2.1.1 Definition

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

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

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

The AIMLInferenceEmulationFunction IOC includes the attribute objectClass and objectInstance from the TOP IOC. The value of attribute objectClass is " AIMLInferenceEmulationFunction " and the value of attribute objectInstance is the DN of the instance of AIMLInferenceEmulationFunction IOC. The DN of the instance of AIMLInferenceFunction is used to uniquely identify the instance of AIMLInferenceFunction.

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

###### 7.3a.2.2.1.2 Attributes

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

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| Attribute name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
|  |  |  |  |  |  |
| **Attributes related to Role** |  |  |  |  |  |

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

None.

###### 7.3a.2.2.1.4 Notifications

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

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| **Next 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: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| candidateTrainingDataSource | It provides the address(es) of the candidate training data source provided by MnS consumer. The detailed training data format is vendor specific.  allowedValues: N/A. | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| aIMLInferenceName | It indicates the type of inference that the ML model supports.  allowedValues: the values of the MDA type (see 3GPP TS 28.104 [2]), Analytics ID(s) of NWDAF (see 3GPP TS 23.288 [3]), types of inference for RAN, and vendor's specific extensions. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| areConsumerTrainingDataUsed | It indicates whether the consumer provided training data have been used for the ML model training.  allowedValues: ALL, PARTIALLY, NONE. | type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| usedConsumerTrainingData | It provides the address(es) where lists of the consumer-provided training data are located, which have been used for the ML model training.  allowedValues: N/A. | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| trainingRequestRef | It is the DN(s) of the related MLTrainingRequest MOI(s).  allowedValues: DN. | type: DN  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| trainingProcessRef | It is the DN(s) of the related MLTrainingProcess MOI(s) that produced the MLTrainingReport.  allowedValues: DN. | type: DN  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| trainingReportRef | It is the DN of the MLTrainingReport MOI that represents the reports of the ML training.  allowedValues: DN. | type: DN  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| lastTrainingRef | It is the DN of the MLTrainingReport MOI that represents the reports for the last training of the ML model.  allowedValues: DN. | type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| modelConfidenceIndication | It indicates the average confidence value (in unit of percentage) that the ML model would perform for inference on the data with the same distribution as training data.  Essentially, this is a measure of degree of the convergence of the trained ML model.  allowedValues: { 0..100 }. | type: integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| trainingRequestSource | It describes the entity that requested to instantiate the MLTrainingRequest MOI.  This attribute can be of type String or DN. | type: <<CHOICE>>  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLTrainingRequest.requestStatus | It describes the status of a particular ML training request.  allowedValues: NOT\_STARTED, IN\_PROGRESS, CANCELLING, SUSPENDED, FINISHED, and CANCELLED. | type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLTrainingProcessId | It identifies the training process.  It is unique in each instantiated process in the MnS producer.  allowedValues: N/A. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| priority | It indicates the priority of the training process.  The priority may be used by the ML training to schedule the training processes. Lower value indicates a higher priority.  allowedValues: { 0..65535 }. | type: integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: 0  isNullable: False |
| terminationConditions | It indicates the conditions to be considered by the MLtraining MnS producer to terminate a specific training process.  allowedValues: MODEL UPDATED\_IN\_INFERENCE\_FUNCTION, INFERENCE FUNCTION\_TERMINATED, INFERENCE FUNCTION\_UPGRADED, INFERENCE\_CONTEXT\_CHANGED. | type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| progressStatus | It indicates the status of the process.  allowedValues: N/A. | type: ProcessMonitor  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLUpdateProcess.cancelProcess | It 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| mLEntityVersion | It indicates the version number of the ML entity.  allowedValues: N/A. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| performanceRequirements | It indicates the expected performance for a trained ML entity when performing on the training data.  allowedValues: N/A. | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| modelPerformanceTraining | It indicates the performance score of the ML entity when performing on the training data.  allowedValues: N/A. | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| mLTrainingProcess.progressStatus.progressStateInfo | It provides the following specialization for the "progressStateInfo" attribute of the "ProcessMonitor" data type for the "MLTrainingProcess.progressStatus".  When the ML 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 trained  The allowed values for " mLTrainingProcess.progressStatus.status " = "CANCELLING" are vendor specific.  The allowed values for " mLTrainingProcess.progressStatus.status " = "NOT\_STARTED" are vendor specific. | Type: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| inferenceOutputName | It indicates the name of an inference output of an ML 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: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| performanceMetric | It indicates the performance metric used to evaluate the performance of an ML entity, e.g. "accuracy", "precision", "F1 score", etc.  allowedValues: N/A. | Type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| performanceScore | It indicates the performance score (in unit of percentage) of an ML 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: Real  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| inferenceEntityRef | It describes the target entities that will use the ML entity for inference. | Type: DN  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| dataProviderRef | It describes the entities that have provided or should provide data needed by the ML entity e.g. for training or inference | Type: DN  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| areNewTrainingDataUsed | It indicates whether the other new training data have been used for the ML model training.  allowedValues: TRUE, FALSE. | type: Boolean  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| trainingDataQualityScore | It indicates numerical value that represents the dependability/quality of a given observation and measurement type. The lowest value indicates the lowest level of dependability of the data, i.e. that the data is not usable at all.  allowedValues: { 0..100 }. | Type: Real  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| decisionConfidenceScore | It is the numerical value that represents the dependability/quality of a given decision generated by the AI/ML inference function. The lowest value indicates the lowest level of dependability of the decisions, i.e. that the data is not usable at all.  allowedValues: { 0..100 }. | Type: Real  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| expectedRuntimeContext | This describes the context where an MLEntity is expected to be applied.  allowedValues: N/A | Type: MLContext  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| trainingContext | This specify the context under which the MLEntity has been trained.  allowedValues: N/A | Type: MLContext  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| runTimeContext | This specifies the context where the MLmodel or entity is being applied.  allowedValues: N/A | Type: MLContext  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLEntityRepositoryRef | It identifies the DN of the MLEntityRepository. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLRepositoryId | It indicates the unique ID of the ML repository. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| modelPerformanceValidation | It indicates the performance score of the ML entity when performing on the validation data.  allowedValues: N/A | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| dataRatioTrainingAndValidation | It indicates the ratio (in terms of quantity of data samples) of the training data and validation data used during the training and validation process. It is represented by the percentage of the validation data samples in the total training data set (including both training data samples and validation data samples). The value is an integer reflecting the rounded number of percent \* 100.    allowedValues: { 0 .. 100 }. | type: Integer  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
|  |  |  |
| MLTestingRequest.requestStatus | It describes the status of a particular ML testing request.  allowedValues: NOT\_STARTED, IN\_PROGRESS, CANCELLING, SUSPENDED, FINISHED, and CANCELLED. | type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLTestingRequest.cancelRequest | It 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| modelPerformanceTesting | It indicates the performance score of the ML entity when performing on the testing data.  allowedValues: N/A. | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| mLTestingResult | It provides the address where the testing result (including the inference result for each testing data example) is provided.  The detailed testing result format is vendor specific.  allowedValues: N/A. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| testingRequestRef | It identifies the DN of the MLTestingRequest MOI.  allowedValues: DN | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| supportedPerformanceIndicators | This parameter lists specific PerformanceIndicator(s) of an ML entity.  allowedValues: N/A. | type: SupportedPerfIndicator  multiplicity: 1..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| performanceIndicatorName | It indicates the identifier of the specific performance indicator.  allowedValues: N/A | type: string  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| isSupportedForTraining | It indicates whether the specific performance indicator is supported a performance metric of ML training for the ML entity Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | type: Boolean  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| isSupportedForTesting | It indicates whether the specific performance indicator is supported a performance metric of ML testing for the ML entity.  Default value is set to "FALSE".  allowedValues: TRUE, FALSE. | type: Boolean  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| mLUpdateProcessRef | It is the DN of the mLUpdateProcess MOI that represents the process of updating an ML entity.  allowedValues: DN. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLUpdateRequestRef | It is the DN of the MLUpdateRequest MOI that represents an  ML update request.  allowedValues: DN. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLUpdateReportRef | It is the DN of the MLUpdateReport MOI that represents an ML update report.  allowedValues: DN. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLUpdateReportingPeriod | It specifies the time duration upon which the MnS consumer expects the ML update is reported. | Type: TimeWindow  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| availMLCapabilityReport | It represents the available ML capabilities.  allowedValues: N/A. | Type: AvailMLCapabilityReport multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| UpdatedMLCapability | It represents the updated ML capabilities.  allowedValues: N/A. | Type: AvailMLCapabilityReport multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| newCapabilityVersionId | It indicates the specific version of AI/ML capabilities to be applied for the update. It is typically the one indicated by the MLCapabilityVersionID in a newCapabilityVersion | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| mlCapabilityVersionId | It indicates the version of ML capabilities that is available for the update. | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| performanceGainThreshold | It defines the minimum performance gain as a percentage that shall be achieved with the capability update, i.e., the difference in the performances between the existing capabilities and the new capabilities should be at least performanceGainThreshold otherwise the new capabilities should not be applied.  Allowed value: float between 0.0 and 100.0 | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| expectedPerformanceGains | It indicates the expected performance gain if/when the AI/ML capabilities of the respective network function are updated with/to the specific set of newly available AI/ML capabilities. | Type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| updateTimeDeadline | It indicates the maximum as stated in the MLUpdate request that should be taken to complete the update | Type: TimeWindow  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLEntityRef | It indicates the DN of MLEntity | Type: DN  multiplicity: 1 .. \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| MLUpdateRequest.requestStatus | It describes the status of a particular ML update request.  allowedValues: NOT\_STARTED, IN\_PROGRESS, CANCELLING, SUSPENDED, FINISHED, and CANCELLED. | Type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| MLUpdateRequest.cancelRequest | It 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| memberMLEntityRefList | It identifies the list of member ML entities within a level of an ML entity coordination group.  allowedValues: DN list | Type: DN  multiplicity: 2..\*  isOrdered: True  isUnique: True  defaultValue: None  isNullable: False |
| mLEntityCoordinationGroupRef | It identifies the DN of the MLEntityCoordinationGroup.  allowedValues: DN | Type: DN  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| retrainingEventsMonitorRef | It indicates the DN of the ThresholdMonitor MOI that indicates the performance measurements and its corresponding thresholds to be used by MnS producer to initiate the re-training of the MLEntity. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: 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: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: 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: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| mLEntityToLoadRef | It identifies the DN of a trained MLEntity requested to be loaded to the target inference function(s). | Type: DN  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| policyForLoading | It provides the policy for controlling ML 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: AIMLManagementPolicy  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| thresholdList | It provides the list of threshold. | Type: ThresholdInfo  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| 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: String  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: 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: Boolean  multiplicity: 0..1  isOrdered: N/A  isUnique: N/A  defaultValue: FALSE  isNullable: False |
| MLEntityLoadingRequestRef | It identifies the DN of the associated MLEntityLoadingRequest.  allowedValues: DN. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| MLEntityLoadingPolicyRef | It identifies the DN of the associated MLEntityLoadingPolicy.  allowedValues: DN. | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| LoadedMLEntityRef | It identifies the DN of the MLEntity that has been loaded to the inference function.  allowedValues: DN | Type: DN  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: True |
| activationStatus | It describes the activation status.  allowedValues: ACTIVATED, DEACTIVATED. | Type: Enum  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| AIMLManagementPolicy  .managedActivationScope | It provides a list of sub scopes for which ML inference is activated as triggered by a policy on the MnS producer. For example, the sub scopes may be a list of cells or of geographical areas. The list is an ordered list indicating the inference is activated for the first sub scope and gradually extended to the next sub scope if the policy evaluates to true.  allowedValues: N/A | Type: ManagedActivationScope  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| AIMLInferenceFunction.managedActivationScope | It provides a list of sub scopes for which ML inference is activated as triggered by a policy on the MnS producer. For example, the sub scopes may be a list of cells or of geographical areas. The list is an ordered list indicating the inference is activated for the first sub scope and gradually extended to the next sub scope if the policy evaluates to true.  allowedValues: N/A | Type: AIMLManagementPolicy  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| ManagedActivationScope.dNList | It indicates the list of DN, the list is an ordered list indicating the inference is activated for the first sub scope and gradually extended to the next sub scope.  allowedValues: N/A | Type: DN  multiplicity: \*  isOrdered: True  isUnique: True  defaultValue: None  isNullable: False |
| ManagedActivationScope.timeWindow | It indicates the list of time window; the list is an ordered list indicating the inference is activated for the first sub scope and gradually extended to the next sub scope.  allowedValues: N/A | Type: TimeWindow  multiplicity: \*  isOrdered: True  isUnique: True  defaultValue: None  isNullable: False |
| ManagedActivationScope.geoPolygon | It indicates the list of GeoArea, the list is an ordered list indicating the inference is activated for the first sub scope and gradually extended to the next sub scope.  allowedValues: N/A | Type: GeoArea  multiplicity: \*  isOrdered: True  isUnique: True  defaultValue: None  isNullable: False |
| usedByFunctionRefList | It provides the DNs of the functions supported by the AIMLInferenceFunction.  allowedValues: N/A | Type: DN  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| inferenceOutputId | It identifies an inference output within an AIMLinferenceReport. | type: String  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| inferenceOutputs | It indicates the Outputs that have been derived by the AIMLInferenceFunction instance from a specific ML entity.  Each ML entity, inferenceOutputs may be a set of values.  allowedValues: N/A. | type: InferenceOutput  multiplicity: 1..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| inferencePerformance | It indicates the performance score of the ML entity during Inference.  allowedValues: N/A. | type: ModelPerformance  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| inferenceOutputTime | It indicates the time at which the inference output is generated.  allowedValues: N/A | Type: DateTime  multiplicity: \*  isOrdered: True  isUnique: True  defaultValue: None  isNullable: False |
| outputResult | It indicates the result of an inference. | type: AttributeValuePair  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: Null  isNullable: False |
| mLCapabilitiesInfoList | It indicates information about what an ML entity can generate inference for.  allowedValues: N/A. | type: MLCapabilityInfo  multiplicity: 1..\*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| capabilityName | It indicates the name of a capability for which an ML entity can generate inference.The capability is defined by Mns producer which can be of traffic analysis capability, coverage analises capability,mobility analises capability or vendor specific extensions.    allowedValues: N/A. | type: String  multiplicity: 1  isOrdered: N/A  isUnique: N/A  defaultValue: None  isNullable: False |
| mLCapabilityParameters | It indicates a set of optional parameters that apply for an aIMLInferenceName and capabilityName.  allowedValues: N/A | Type: AttributeValuePair  multiplicity: \*  isOrdered: False  isUnique: True  defaultValue: None  isNullable: False |
| NOTE: When the performanceScore is to indicate the performance score for ML 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. | | |

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| **Next change** |

# A.14 PlantUML code for Figure 7.3a.2.1.1-1: NRM fragment for AI/ML inference emulation Control

@startuml

scale max 350 height

skinparam ClassStereotypeFontStyle normal

skinparam ClassBackgroundColor White

skinparam shadowing false

skinparam monochrome true

hide members

hide circle

'skinparam maxMessageSize 250

class ManagedEntity <<ProxyClass>>

class AIMLInferenceEmulationFunction <<InformationObjectClass>>

class AIMLInferenceReport << InformationObjectClass >>

ManagedEntity "1" \*-- "\*" AIMLInferenceEmulationFunction: <<names>>

AIMLInferenceEmulationFunction "1" \*-- "\*" AIMLInferenceReport : <<names>>

note left of ManagedEntity

Represents the following IOCs:

SubNetwork or

ManagedFunction or

Managed Element

end note

# @endumlA.15 PlantUML code for Figure 7.3a.2.1.2-1: AI/ML inference emulation Inheritance Relations

@startuml

skinparam ClassStereotypeFontStyle normal

skinparam ClassBackgroundColor White

skinparam shadowing false

skinparam monochrome true

hide members

hide circle

'skinparam maxMessageSize 250

class ManagedFunction <<InformationObjectClass>>

class AIMLInferenceEmulationFunction << InformationObjectClass >>

ManagedFunction <|-- AIMLInferenceEmulationFunction

@enduml

|  |
| --- |
| **End of change** |