**3GPP TSG-SA5 Meeting #162 *S5-253330***

Goteborg, Sweden, 25 - 29 April 2025

|  |
| --- |
| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  |  | **CR** | **draftCR** | **rev** |  | **Current version:** |  |  |
|  |
| *For* [***HELP***](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:***  | Input to DraftCR TS28.105 Coordination AIML inference capabilities |
|  |  |
| ***Source to WG:*** | Nokia |
| ***Source to TSG:*** | SA5 |
|  |  |
| ***Work item code:*** | AIML\_MGT\_Ph2 |  | ***Date:*** | 2025-08-22 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-19 |
|  | *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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | This CR to introduce the agreed use case and requirements in TR28.858 on Coordination AIML inference capabilities  |
|  |  |
| ***Summary of change:*** | Add the use case and requirements.  |
|  |  |
| ***Consequences if not approved:*** | The proposed use case of Coordination AIML inference capabilities is not supported. |
|  |  |
| ***Clauses affected:*** | 6.5.3.2.Y (new), 6.5.3.3 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

***Start of First change***

### 6.5.3 AI/ML inference capabilities management

#### 6.5.3.2 Use cases

##### 6.5.3.2.Y Coordinating effects of AI/ML inference functions recommendations

AIML inference functions acting on a network may differ in source vendors and behavioural characteristics. For security and operability reasons, the operator may not grant network control rights to all the AIML inference functionsOne inference function acting as an MnS consumer can take responsibility for performance of a wider network scopeevaluating the state of the network scope and based on the registrered capabilities of different AIML inference functions, it triggers otherAIML inference functions. The network state is a set of configuration, performance and fault values for the diffenet managed objects of te network. The inference function evaluates the recommendations of the other AIML inference functions and their likely effects to decide the changes that should be executed on the network (e.g. to minimize concurrent changes on the same network resources).

Each inference functioninforms the other AIML inference functions (acting as MnS consumers) of the respective feedback related to their recommended actions. The feedback may be in form of a dimensionless Action Quality Indicator that describes how acceptable or not acceptable the actions are. The feedback may be provided by other AIML inference functions whose predictions may be impacted by the actions other inference functions. The Action Quality Indicator is over the scope of the inference function that providing that feedback.

To determine which AIML inference function caused the impact that is observed by another inference function, the MnS producer should inform the the other AIML inference functions (acting as MnS consumers) of of the potential impacting predictions.

Based on, e.g., insights from network states analytics on normal or abnormal network states, the MnS consumer may(re)configure the AIML inference functions based on the observed effects of their actions (e.g. to redefine the control parameter space of the individual AIML inference functions).

NOTE: Coordination AIML Inference is only applicable within the management system in this document

#### 6.5.3.3 Requirements for AI/ML inference capabilities management

Table 6.5.3.3-1

| Requirement label | Description | Related use case(s) |
| --- | --- | --- |
| **REQ-ML\_CAP-01** | The AI/ML inference MnS Producer shall have a capability allowing an authorized MnS consumer to request the capabilities of existing ML entities available within the AI/ML inference producer. | Identifying capabilities of ML entities (clause 6.5.3.2.1) |
| **REQ- ML\_CAP-02** | The AI/ML inference MnS Producer shall have a capability to report to an authorized MnS consumer the capabilities of an ML entity as a decision described as a triplet <object(s), parameters, metrics> with the entries respectively indicating: the object or object types for which the ML entity can undertake optimization or control; the configuration parameters on the stated object or object types, which the ML entity optimizes or controls to achieve the desired outcomes; and the network metrics which the ML entity optimizes through its actions. | Identifying capabilities of ML entities (clause 6.5.3.2.1) |
| **REQ-ML\_CAP-03** | The AI/ML inference MnS Producer shall have a capability to report to an authorized MnS consumer the capabilities of an ML entity as an analysis described as a tuple <object(s), characteristics> with the entries respectively indicating: the object or object types for which the ML entity can undertake analysis; and the network characteristics (related to the stated object or object types) for which the ML entity produces analysis | Identifying capabilities of ML entities (clause 6.5.3.2.1) |
| **REQ-ML\_CAP-04** | The AI/ML inference MnS Producer shall have a capability allowing an authorized MnS consumer to request a mapping of the consumer's inference targets to the capabilities of one or more ML entities. | Mapping of the capabilities of ML entities (clause 6.5.3.2.2) |
| **REQ-ML\_COORD-1** | The MnS producer of AI/ML inference should have a capability enabling an authorized MnS consumer to trigger the AIML inference function to provide inference output to address an observed network state. | Coordination of effects of AI/ML inference functions recommendations (clause 6.5.3.2.2) |
| **REQ-ML\_COORD-2** |  The MnS producer of AI/ML inference should have a capability enabling another inference function acting as an MnS consumer to inform the MnS producer of a inference output that is applied and that may have impact on that MnS producer's predictions. | Coordination of effetcs of AI/ML inference functions recommendations (clause 6.5.3.2.2) |
| **REQ-ML\_COORD-3** | The MnS producer of AI/ML inference should have a capability enabling an authorized MnS consumer or another inference function to provide an index that describes the impacts of the predictions made by the MnS producer of AI/ML inference  | Coordination of effects of AI/ML inference functions recommendations (clause 6.5.3.2.2) |

***Start of the next Change***

##### 7.3a.4.2.5 AIMLInferenceFunction

###### 7.3a.4.2.5.1 Definition

This IOC represents the common properties of the AI/ML inference function.

This AIMLInferenceFunction instance can be created by the system or pre-installed.

The AIMLInferenceFunction MOI may be associated with one or more MOIs that represent the functions/functionalities (Note) provided by the subject AIMLInferenceFunction MOI.

The AIMLInferenceFunction MOI can be only created by the MnS producer but not consumer.

The MOI of AIMLInferenceFunction or the MOI of the IOC inheriting from the AIMLInferenceFunction IOC contains one or more MOI(s) of MLModel.

NOTE: The IOCs representing the functions/functionalities (Note) that use the AI/ML inference function include MDAFunction, AnLFFunction, DMROFunction, DLBOFunction, LMFFunction, and DESManagementFunction.

The AIMLInferenceFunction MOI may be contained by either a SubNetwork MOI, a ManagedElement MOI, or an MOI of ManagedFunction’s subclass, and it is allowed for an MnS producer to support multiple AIMLInferenceFunction MOIs contained in different superordinated MOIs among SubNetwork, ManagedElement and the ManagedFunction’s subclass.

The generation of inference outputs is based on the configuration of inference, e.g., to start a stated time, or to be executed at all times. The observations of the inference function and information on derived Outputs is registered in the inference report.

###### 7.3a.4.2.5.2 Attributes

The AIMLInferenceFunction IOC includes attributes inherited from ManagedFunction IOC (defined in TS 28.622 [12]) and the following attributes:

Table 7.3a.4.2.5.2-1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Support Qualifier | isReadable | isWritable | isInvariant | isNotifyable |
| activationStatus | M | T | T | F | T |
| managedActivationScope | O | T | T | F | T |
| problemManagedObjectList  | M | T | T | F | T |
| impactFulInferences | M | T | T | F | T |
| **Attributes related to role** |  |  |  |  |  |
| usedByFunctionRefList | M | T | F | F | T |
| mLModelRefList | M | T | F | T | T |

###### 7.3a.4.2.5.3 Attribute constraints

None.

###### 7.3a.4.2.5.4 Notifications

The common notifications defined in clause 7.6 are valid for this IOC, without exceptions or additions.7.3a.4.2.6

***Next change***

7.4.X3 PotentialImpactInfo <<dataType>>

7.4.X3.1 Definition

This datatype define the potential network impacts due to the inference output results.

7.4.X3.2 Attributes

The PotentialImpactInfo includes the following attributes:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Support Qualifier** | **isReadable** | **isWritable** | **isInvariant** | **isNotifyable** |
| impactedScope | M | T | F | F | T |
| impactedPM | M | T | F | F | T |
| inferenceAQI | M | T | T | F | T |

7.4.X3.3 Attribute constraints

None.

7.4.X3.4 Notifications

The notifications specified for the IOC using this <<datatype>> for its attribute(s), shall be applicable.

***Next change***

## 7.5 Attribute definitions

### 7.5.1 Attribute properties

| **Attribute Name** | **Documentation and Allowed Values** | **Properties** |
| --- | --- | --- |
| mLModelId | It identifies the ML model.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 |
| **================ Unedited Portion of the table not showed =================** |
| allowedClusterTrainingTime | This defines the combined time limit within which the training of ML models cluster shall be completed. A cluster of ML models takes more time to train together as compared to time taken for training an individual ML model. The criteria allows accommodating only those ML models whose training time does not exceed the set combined time limit | type: TimeWindowmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: NoneisNullable: True |
| preferredModelDiversity | This defines the consumer preferred model diversity types that is to be considered for models clustering. For example, decision trees, neural networks, linear regression and like so | type: Stringmultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| problemManagedObjectList  | It indicates a list of network entites for which coordination of inference is required and which the MnS consumer would like the inference function to provide recommendations. It indicates the DN of network entities which the inference function needs to monitor and decide if certain actions are needed. | type: DNmultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| impactFulInferences | It indicates the DN of an AIMLInferenceReport that contains the set inferences which have been activated on to the network and are likely to impact the outcomes of the inference function. The inference function that receives impactFulInferences gets to knows that the recommendations in the indicated AIMLInferenceReport have been applied and it should watch for the outcomes. | type: DNmultiplicity: \*isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| inferenceAQI | It indicates the Action Quality Index expressing the degree to which the inferences in the inference report have affected other inference functions. The inferenceAQI is an integer in the range [-100,100] where 0 indicates no impact at all while -100 means that the recommendation is unacceptable (so the action should not be rused), 0 implies no (negative or positive) impact while 100 implies that the action improved the metrics of the reporting inference function.allowedValues: integers in the range [-100,100] | type: Integermultiplicity: 1isOrdered: N/AisUnique: N/AdefaultValue: None isNullable: False |
| NOTE: When the performanceScore is to indicate the performance score for ML model training, the data set is the training data set. When the performanceScore is to indicate the performance score for ML validation, the data set is the validation data set. When the performanceScore is to indicate the performance score for ML model testing, the data set is the testing data set. |

* ***problemManagedObjectList* requires inference function to provide recommendations on a list of problem instances. What are these recommendations? How they are decided? And what is a problem instance?**
* **It is not clear how the inference function that receives *impactFulInferences* gets to know that the related recommendations have been applied.**

***End of changes***