**3GPP TSG-SA5 Meeting #158 *S5-247088***

Orlando, USA, 18 - 22 November 2024

**Source: Ericsson India Private Limited (TSDSI)**

**Title: PCR TR 28.858 Correct model training for multiple contexts**

**Document for:Approval**

**Agenda Item:** **FS\_AIML\_MGT\_Ph2**

# 1 Decision/action requested

***approval***

# 2 References

[1] 3GPP TR 28.858 “Study on Artificial Intelligence / Machine Learning (AI/ML) management Phase 2”.

[2] 3GPP TS 28.105: Artificial Intelligence / Machine Learning (AI/ML) management".

# 3 Rationale

The proposed solution in clause 5.1.4.4 suggests enhancements to the MLTrainingRequest IOC to support clustering; however, this functionality is have already been specified through use case ML Joint defined in 28.105 [2].

This contribution proposes to update evaluation and Requirements for TR 28.858[1] clause 5.1.4 “ML model training for multiple contexts” to indicate that the use case is already covered by TS 28.105.

# 4 Detailed proposal

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| **1st Change** |

### 5.1.4 ML model training for multiple contexts

#### 5.1.4.1 Description

ML models can be trained for similar contexts allowing for efficient management of these ML models. If an ML model that is trained for a particular context needs to be updated, it can be realized using an ML model that was trained for different context as the baseline.

#### 5.1.4.2 Use cases

##### 5.1.4.2.1 ML model training for multiple contexts

Although the ML model may provide an AI/ML inference service for multiple scenarios, there are similarities in the contexts where ML models operate and perform AI/ML inferences. For e.g., two ML model instances for the same inference type in urban or rural areas would have significant overlap in their contexts. The context similarity can be leveraged in forming a cluster of ML models, where ML model instances in the cluster are either trained from the same previously trained ML model or from an ML model previously trained for another similar context as the baseline. The training of an ML model for multiple contexts allows for efficiency by cluster training rather than individually training each one of them. ML training needs to support the capability to train the cluster of ML models from the same baseline ML model or from an ML model previously trained for another similar context as the baseline. As input to the training, the clustering criteria needed to distinguish the ML model instances may be provided by the MnS consumer.

In the case of degradation of ML models, updating of ML models is expected to be triggered. For ML models created through cluster training, the retraining of a degraded ML model could be triggered to start from another member of the cluster, i.e. start from an ML model with another context to create a new ML model with the desired context.

#### 5.1.4.3 Potenital Requirements

**REQ-ML\_CLUSTER-TRAIN-1:** The MLT MnS producer should have a capability for an authorized MnS consumer to request training of a cluster of ML models associated to a set of multiple contexts from a previously trained ML model.

#### 5.1.4.4 Possible solutions

##### 5.1.4.4.X Possible Solution#1

The MLTrainingRequest IOC has to be extended with:

* a flag indicating that a cluster of ML models has to be trained.
* a clustering criteria indicating which ML models can be formed the cluster, This may indicate context similarities, e.g., similar geographical location, training data similarities etc. Take traffic congestion analysis as example, two ML model instances for one specific inference type during peak and off-peak hours would have significant geographical similarity in their contexts, these two models can be placed in one cluster.the DN of the ML instance to be used as the baseline to train another ML model with a related context.
* the expectedRunTimeContext can be used to capture the context of new ML models that should be trained.

##### 5.1.4.4.X Possible Solution#2

The specified use case for “ML model joint training” specified in TS 28.105[2] can support the use case described above by reusing mLModelCoordinationGroup IOC, as well as the existing attributes mLModelRef or mLModelCoordinationGroupRef included in MLTrainingRequest IOC allows for multiple contexts as well to provide ml model reference to a model that has already been trained. 5.1.4.5 Evaluation

The solution described in clause 5.1.4.4 proposes the addition of new attributes to the MLTrainingRequest IoC to enable the MnS consumer to request training of a cluster of ML models associated to a set of multiple contexts from a previously trained ML model.

Proposed Solution 2# does not identify a need for introducing any new attributes for supporting clustering and multi-context training. The solution proposed for clustering in 5.1.4.4 can be realized with already specified use case “ML model joint training” in TS 28.105 [2] clause 6.2b.2.6. For the use of a base model to train the MLModelCoordinationGroup solution, is already specified in the NRM definition for MLTrainingRequest in TS 28.105 [2], clause 7.3a.1.2.2, were the use of mLModelRef or mLModelCoordinationGroupRef attributes allows a base model to be used when requesting training.

Furthermore, Requirement REQ-ML\_CLUSTER-TRAIN-1 is already covered by REQ- ML\_TRAIN-FUN-07, REQ- ML\_TRAIN-FUN-08 and REQ- ML\_TRAIN-FUN-09 .~~Therefore there is no need for further development in normative specification for this use case.~~

The feasibility of using mLModelCoordinationGroup related information elements, defined in TS 28.105, to implement solution#2 requires further investigation in the normative work.

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| **End of Change** |