**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *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:***  |  |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** | S5 |
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| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | Correct solution for requirement related to “ML training initiated by producer” to fit Rel-18 specification |
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| ***Summary of change:*** | This contribution proposes to correct clause 6.2a.1.2.2 and requirement related to it.Clean up use case ML training requested by consumer to the solution. |
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| ***Consequences if not approved:*** | leads to incorrect implementation. |
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| ***Clauses affected:*** | 6.2a.1.2.1, 6.2a.1.2.2 and 6.2a.1.3 |
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|  | **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 ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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| **Start of modification** |

#### 6.2a.1.2 Use cases

##### 6.2a.1.2.1 ML training requested by consumer

Figure 6.2a.1.2.1-1: ML training requested by MLT MnS consumer

The ML training may be triggered by the request(s) from one or more MLT MnS consumer(s). The consumer may be for example a network function, a management function, an operator, or another functional differentiation.

To trigger an initial ML training, the MnS consumer needs to specify in the ML training request the inference type which indicates the function or purpose of the ML entity, e.g. CoverageProblemAnalysis [see TS 28.104 [2]]. The MLT MnS producer can perform the initial training according to the designated inference type. To trigger an ML re-training, the MnS consumer needs to specify in the ML training request the identifier of the ML entity to be re-trained.

The consumer may provide the data source(s) that contain(s) the training data which are considered as inputs candidates for training. To obtain the valid training outcomes, consumers may also designate their requirements for model performance (e.g. accuracy, etc) in the training request.

The performance of the ML entity depends on the degree of commonality between the distribution of the data used for training and the distribution of the data used for inference. As time progresses, the distribution of the input data used for inference might change as compared to the distribution of the data used for training. In such a scenario, the performance of the ML entity degrades over time. The MLT MnS producer may re-train the ML model associated to the entity if the inference performance of the ML entity falls below a certain threshold, which needs to be configurable by the MnS consumer.

Following the ML training request by the MLT MnS consumer, the MLT MnS producer provides a response to the consumer indicating whether the request was accepted.

If the request is accepted, the MLT MnS producer decides when to start the ML training with consideration of the request(s) from the consumer(s). Once the training is decided, the producer performs the following:

- selects the training data, with consideration of the consumer provided candidate training data. Since the training data directly influences the algorithm and performance of the trained ML entity, the MLT MnS producer may examine the consumer's provided training data and decide to select none, some or all of them. In addition, the MLT MnS producer may select some other training data that are available;

- trains the ML model using the selected training data;

- provides the training results (including the identifier of the ML entity generated from the initially trained ML model or the version number of the ML entity associated with the re-trained model, training performance results, etc.) to the MLT MnS consumer(s).

##### 6.2a.1.2.2 ML training initiated by producer

The ML re-training may be initiated by the MLT MnS producer, for instance as a result of performance evaluation of the ML entity or based on feedback or new training data received from the consumer, or when new training data, which are not from the consumer, describing the new network status/events become available.

Therefore, there is a need to monitor the performance and/or the KPIs of the ML entity and use the thresholds that the MLT MnS consumer configured for the MLT MnS producer to trigger the training or re-training.

When the MLT MnS producer decides to start the ML training, the producer performs the followings:

- selects the training data;

- trains the ML model using the selected training data;

- provides the training results (including the identifier of the ML entity generated from the initially trained ML model or the version number of the ML entity associated with the re-trained model, training performance, etc.) to the MLT MnS consumer(s) who have subscribed to receive the ML training results.

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| **End of modification** |

#### 6.2a.1.3 Requirements for ML training

Table 6.2a.1.3-1

| Requirement label | Description | Related use case(s) |
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| **REQ-ML\_TRAIN-FUN-01** | The MLT MnS producer shall have a capability allowing an authorized MLT MnS consumer to request ML training. | ML training requested by consumer (clause 6.2a.1.2.1) |
| **REQ- ML\_TRAIN-FUN-02** | The MLT MnS producer shall have a capability allowing the authorized MLT MnS consumer to specify the data sources containing the candidate training data for ML training. | ML training requested by consumer (clause 6.2a.1.2.1) |
| **REQ- ML\_TRAIN-FUN-03** | The MLT MnS producer shall have a capability allowing the authorized MLT MnS consumer to specify the inference type of the ML entity to be trained. | ML training requested by consumer (clause 6.2a.1.2.1) |
| **REQ- ML\_TRAIN-FUN-04** | The MLT MnS producer shall have a capability to provide the training result to the MLT MnS consumer. | ML training requested by consumer (clause 6.2a.1.2.1), ML training initiated by producer (clause 6.2a.1.2.2) |
| **REQ- ML\_TRAIN-FUN-05** | The MLT MnS producer shall have a capability allowing an authorized MLT MnS consumer to configure the thresholds of the performance measurements and/or KPIs to trigger the re-training of an ML entity. (See Note) | ML training initiated by producer (clause 6.2a.1.2.2) |
| **REQ- ML\_TRAIN-FUN-06** | The MLT MnS producer shall have a capability to provide the version number of the ML entity MLT MnS consumer. | ML training requested by consumer (clause 6.2a.1.2.1), /ML training initiated by producer (clause 6.2a.1.2.2) |
| **REQ- ML\_TRAIN-FUN-07** | The MLT MnS producer shall have a capability allowing an authorized MLT MnS consumer to manage the training request to start, cancel or suspend the training request, and configuring the ML context for ML training. | ML training requested by consumer (clause 6.2a.1.2.1), ML training initiated by producer (clause 6.2a.1.2.2), ML entity joint training (clause 6.2a.1.2.6) |
| **REQ- ML\_TRAIN-FUN-08** | The MLT MnS producer should have a capability to provide the grouping of ML entities to an authorized MLT MnS consumer to enable coordinated inference. | ML entity joint training (clause 6.2a.1.2.6) |
| **REQ- ML\_TRAIN-FUN-09** | The MLT MnS producer should have a capability to allow an authorized MLT MnS consumer to request joint training of a group of ML entities. | ML entity joint training (clause 6.2a.1.2.6) |
| **REQ- ML\_TRAIN-FUN-10** | The MLT MnS producer should have a capability to jointly train a group of ML entities and provide the training results to an authorized consumer. | ML entity joint training (clause 6.2a.1.2.6) |
| **REQ-ML\_SELECT-01** | 3GPP management system shall have a capability to enable an authorized MLT MnS consumer to discover the properties of available ML entities including the contexts under which each of the models associated with the ML entities were trained. | ML model and ML entity selection (clause 6.2a.1.2.3) |
| **REQ-ML\_SELECT-02** | 3GPP management system shall have a capability to enable an authorized MLT MnS consumer to select an ML entity to be used for inference. | ML models and ML entity selection (clause 6.2a.1.2.3) |
| **REQ-ML\_SELECT-03** | 3GPP management system shall have a capability to enable an authorized MLT MnS consumer to request for information and be informed about the available alternative ML entities of differing complexity and performance. | ML model and ML entity selection (clause 6.2a.1.2.3) |
| **REQ-ML\_SELECT-04** | The 3GPP management system shall have a capability to provide a selected ML entity to the authorized MLT MnS consumer. | ML model and ML entity selection (clause 6.2a.1.2.3) |
| **REQ-ML\_TRAIN- MGT-01** | The MLT MnS producer shall have a capability allowing an authorized consumer to manage and configure one or more requests for the specific ML training, e.g. to modify the request or to delete the request.  | ML training requested by consumer (clause 6.2a.2.1), Managing ML Training Processes (clause 6.2a.1.2.4) |
| **REQ-ML\_TRAIN- MGT-02** | The MLT MnS producer shall have a capability allowing an authorized MLT MnS consumer to manage and configure one or more training processes, e.g. to start, suspend or restart the training. | ML training requested by consumer (clause 6.2a.1.2.1),Managing ML training processes (clause 6.2a.1.2.4) |
| **REQ-ML\_TRAIN- MGT-03** | 3GPP management system shall have a capability to enable an authorized MLT MnS consumer (e.g. the function/entity different from the function that generated a request for ML training) to request for a report on the outcomes of a specific training instance. | Managing ML training processes (clause 6.2a.1.2.4) |
| **REQ-ML\_TRAIN- MGT-04** | 3GPP management system shall have a capability to enable an authorized MLT MnS consumer to define the reporting characteristics related to a specific training request or training instance. | Managing ML training processes (clause 6.2a.1.2.4) |
| **REQ-ML\_TRAIN- MGT-05** | 3GPP management system shall have a capability to enable the MLT function to report to authorized MLT MnS consumer about specific ML training process and/or report about the outcomes of ML training process. | Managing ML training processes (clause 6.2a.1.2.4) |
| **REQ-ML\_ERROR-01** | The 3GPP management system shall enable an authorized consumer of data services (e.g. an MLT function) to request from a producer of data services a Value Quality Score of the data, which is the numerical value that represents the dependability/quality of a given observation and measurement type. | Handling errors in data and ML decisions (clause 6.2a.1.2.5) |
| **REQ-ML\_ERROR-02** | The 3GPP management system shall enable an authorized consumer to request ML decision confidence score which is the numerical value that represents the dependability/quality related to the associated performance metric. | Handling errors in data and ML decisions (clause 6.2a.1.2.5) |
| **REQ-ML\_ERROR-03** | The 3GPP management system shall enable a producer of data services (e.g. a gNB) to provide to an authorized consumer (e.g. an MLT function) a Value Quality Score of the data, which is the numerical value that represents the dependability/quality of a given observation and measurement type. | Handling errors in data and ML decisions (clause 6.2a.1.2.5) |
| **REQ-ML\_ERROR-04** | The 3GPP management system shall enable a producer of ML decisions (e.g. an AI/ML inference function) to provide to an authorized consumer of ML decisions (e.g. a controller) an AI/ML decision confidence score which is the numerical value that represents the dependability/quality of a given decision generated by the AI/ML inference function. | Handling errors in data and ML decisions (clause 6.2a.1.2.5) |
| **REQ-ML\_VLD-01** | The MLT MnS producer should have a capability to validate the ML entities during the ML training process and report the performance of the ML entities on both the training data and validation data to the authorized consumer. | ML entity validation performance reporting (clause 6.2a.1.2.7) |
| **REQ-ML\_VLD-02** | The MLT MnS producer should have a capability to report the ratio (in terms of quantity of data samples) of the training data and validation data used during the ML training and validation process. | ML entity validation performance reporting (clause 6.2a.1.2.7) |
| **REQ-TRAIN\_EFF-01** | The 3GPP management system should have the capability to allow an authorized consumer to configure an ML training function to report the effectiveness of data used for model training.  | Training data effectiveness reporting (clause 6.2a.1.2.8) |
| NOTE: The performance measurements and KPIs are specific to each type (i.e., the inference type that the ML entity supports) of ML entity. |

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| **End of modification** |