**3GPP TSG-SA5 Meeting #162 *S5-253516***

Goteborg, Sweden, 25 - 29 August 2025

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **28.105** | **CR** |  | **rev** | **-** | **Current version:** | **19.1.0** |  |
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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:*** | InputToDraftCR TS 28.105 for Add use case, requirements for training conflict management for reinforcement learning | | | | | | | | | |
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| ***Source to WG:*** | HUAWEI | | | | | | | | | |
| ***Source to TSG:*** | SA5 | | | | | | | | | |
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| ***Work item code:*** | AIML\_MGT\_Ph2 | | | | |  | ***Date:*** | | | 2025-08-15 |
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| ***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 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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
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| ***Reason for change:*** | | In TR 28.858, the reinforcement learning (RL) management has been disscussed to support the AI/ML-based network functions which need to make decisions by taking actions according to the dynamic environment. However, the RL management is not currently supported by TS 28.105. Due to the RL processes of multiple ML models may share a same environment, the training conflict may happen to the operational network. To management the training conflict for RL, the use case, requirements and related information model enhacement should be considered in TS 28.105. | | | | | | | | |
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| ***Summary of change:*** | | Add use case and requirements of training conflict management for RL in clause 6.2b. | | | | | | | | |
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| ***Consequences if not approved:*** | | The reinforcement learning process may fail if conflicts are not identified. | | | | | | | | |
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| ***Clauses affected:*** | | 6.2b.2.X.1, 6.2b.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 ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| **1st Change** |

#### 6.2b.2.16 Management of Reinforcement Learning

##### 6.2b.2.16.2 Use cases

###### 6.2b.2.16.2.X Training Conflict Management for Reinforcement Learning

The training process of RL is realized by the actions with their impacts to the RL environment. In case of RL environment is in the real network, if there are multiple RL training processes (of multiple ML models for different AI/ML inference functions) sharing a same RL environment, simultaneously, they may interfere with each other, which may cause the training conflict.

To be specific, if multiple ML training processes of RL have conflicts, their agents may make actions at the same time, then the state of the RL environment will be affected by these actions. This kind of training error will result in the performance loss of the trained ML models, even cause the training process difficult to converge.

Thus, for controling the conflict of reinforcement learning, the MnS consumer should know whether there are conflicts during the RL training. The producer should determine the conflict and the MnS consumer may specify the conflict resolution requirements to producer. If this conflict resolution policy can not resolve the conflict, the producer may provide the training conflict indication in RL training to authorized MnS consumer. For example, the consumer can cancel/suspend some training processes.

### 6.2b.3 Requirements for ML model training

**Table 6.2b.3-1**

| **Requirement label** | **Description** | **Related use case(s)** |
| --- | --- | --- |
| **REQ-ML\_TRAIN-FUN-01** | The ML training MnS producer shall have a capability allowing an authorized ML training MnS consumer to request ML model training. | ML model training requested by consumer (clause 6.2b.2.1) |
| **REQ- ML\_TRAIN-FUN-02** | The ML training MnS producer shall have a capability allowing the authorized ML training MnS consumer to specify the data sources containing the candidate training data for ML model training. | ML model training requested by consumer (clause 6.2b.2.1) |
| **REQ- ML\_TRAIN-FUN-03** | The ML training MnS producer shall have a capability allowing the authorized ML training MnS consumer to specify the AI/ML inference name of the ML model to be trained. | ML model training requested by consumer (clause 6.2b.2.1) |
| **REQ- ML\_TRAIN-FUN-04** | The ML training MnS producer shall have a capability to provide the training result to the ML training MnS consumer. | ML model training requested by consumer (clause 6.2b.2.1), ML model training initiated by producer (clause 6.2b.2.2) |
| **REQ- ML\_TRAIN-FUN-05** | The ML training MnS producer shall have a capability allowing an authorized ML training MnS consumer to configure the thresholds of the performance measurements and/or KPIs to trigger the re-training of an ML model. (See Note) | ML model training initiated by producer (clause 6.2b.2.2) |
| **REQ- ML\_TRAIN-FUN-06** | The ML training MnS producer shall have a capability to provide the version number of the ML model when it is generated by ML model re-training to the authorized ML training MnS consumer. | ML model training requested by consumer (clause 6.2b.2.1), ML model training initiated by producer (clause 6.2b.2.2) |
| **REQ- ML\_TRAIN-FUN-07** | The ML training MnS producer shall have a capability allowing an authorized ML training MnS consumer to manage the training process, including starting, suspending, or resuming the training process, and configuring the ML context for ML model training. | ML model training requested by consumer (clause 6.2b.2.1), ML model training initiated by producer (clause 6.2b.2.2), ML model joint training (clause 6.2b.2.6) |
| **REQ- ML\_TRAIN-FUN-08** | The ML training MnS producer should have a capability to provide the grouping of ML models to an authorized ML training MnS consumer to enable coordinated inference. | ML model joint training (clause 6.2b.1.2.6) |
| **REQ- ML\_TRAIN-FUN-09** | The ML training MnS producer should have a capability to allow an authorized ML training MnS consumer to request joint training of a group of ML models. | ML model joint training (clause 6.2b.2.6) |
| **REQ- ML\_TRAIN-FUN-10** | The ML training MnS producer should have a capability to jointly train a group of ML models and provide the training results to an authorized consumer. | ML model joint training (clause 6.2b.2.6) |
| **REQ-ML\_SELECT-01** | 3GPP management system shall have a capability to enable an authorized ML training MnS consumer to discover the properties of available ML models including the contexts under which each of the models were trained. | ML model and ML model selection (clause 6.2b.2.3) |
| **REQ-ML\_SELECT-02** | 3GPP management system shall have a capability to enable an authorized ML training MnS consumer to select an ML model to be used for inference. | ML models and ML model selection (clause 6.2b.2.3) |
| **REQ-ML\_SELECT-03** | 3GPP management system shall have a capability to enable an authorized ML training MnS consumer to request for information and be informed about the available alternative ML models of differing complexity and performance. | ML model and ML model selection (clause 6.2b.2.3) |
| **REQ-ML\_SELECT-04** | The 3GPP management system shall have a capability to provide a selected ML model to the authorized ML training MnS consumer. | ML model and ML model selection (clause 6.2b.2.3) |
| **REQ-ML\_TRAIN- MGT-01** | The ML training MnS producer shall have a capability allowing an authorized consumer to manage and configure one or more requests for the specific ML model training, e.g. to modify the request or to delete the request. | ML model training requested by consumer (clause 6.2b.2.1), Managing ML model Training Processes (clause 6.2b.2.4) |
| **REQ-ML\_TRAIN- MGT-02** | The ML training MnS producer shall have a capability allowing an authorized ML training MnS consumer to manage and configure one or more training processes, e.g. to start, suspend or restart the training. | ML model training requested by consumer (clause 6.2b.2.1),  Managing ML model training processes (clause 6.2b.2.4) |
| **REQ-ML\_TRAIN- MGT-03** | 3GPP management system shall have a capability to enable an authorized ML training MnS consumer (e.g. the function/model different from the function that generated a request for ML model training) to request for a report on the outcomes of a specific training instance. | Managing ML model training processes (clause 6.2b.2.4) |
| **REQ-ML\_TRAIN- MGT-04** | 3GPP management system shall have a capability to enable an authorized ML training MnS consumer to define the reporting characteristics related to a specific training request or training instance. | Managing ML model training processes (clause 6.2b.2.4) |
| **REQ-ML\_TRAIN- MGT-05** | 3GPP management system shall have a capability to enable the ML training function to report to any authorized ML training MnS consumer about specific ML model training process and/or report about the outcomes of any such ML model training process. | Managing ML model training processes (clause 6.2b.2.4) |
| **REQ-ML\_ERROR-01** | The 3GPP management system shall enable an authorized consumer of data services (e.g. an ML training 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 6.2b.2.5) |
| **REQ-ML\_ERROR-02** | The 3GPP management system shall enable an authorized consumer of AI/ML decisions (e.g. a controller) to request ML decision confidence score which is the numerical value that represents the dependability/quality of a given decision generated by an AI/ML inference function. | Handling errors in data and ML decisions (clause 6.2b.2.5) |
| **REQ-ML\_ERROR-03** | The 3GPP management system shall have a capability to enable an authorized consumer to provide to the ML Training MnS producer, a training data quality score, 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 6.2b.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 6.2b.2.5) |
| **REQ-ML\_VLD-01** | The ML training MnS producer should have a capability to validate the ML models during the ML model training process and report the performance of the ML models on both the training data and validation data to the authorized consumer. | ML model validation performance reporting (clause 6.2b.2.7) |
| **REQ-ML\_VLD-02** | The ML training 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 model training and validation process. | ML model validation performance reporting (clause 6.2b.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 6.2b.2.8) |
| **REQ-ML\_TRAIN\_PM-1** | The ML Training MnS producer should have a capability to allow an authorized consumer to get the capabilities about what kind of ML models the ML training function is able to train. | Performance indicator selection for ML model training (clause 6.2b.2.9.2) |
| **REQ-ML\_TRAIN\_PM-2** | The ML Training MnS producer should have a capability to allow an authorized consumer to query what performance indicators are supported by the ML model training for each ML model. | ML model performance indicators query and selection for ML model training (clause 6.2b.2.9.3) |
| **REQ-ML\_TRAIN\_PM-3** | The ML Training MnS producer should have a capability to allow an authorized consumer to select the performance indicators from those supported by the ML training function for reporting the training performance for each ML model. | ML model performance indicators query and selection for ML model training (clause 6.2b.2.9.3) |
| **REQ-ML\_TRAIN\_PM-4** | The ML Training MnS producer should have a capability to allow an authorized consumer to provide the performance requirements for the ML model training using the selected the performance indicators from those supported by the ML training function. | MnS consumer policy-based selection of ML model performance indicators for ML model training (clause 6.2b.2.9.4) |
| **REQ-MLKTL-1** | The 3GPP management systemshould have a capability to enable an authorized MnS consumer to discover or request all or part of the available shareable knowledge at a given MLKTL MnS producer. | ML-Knowledge-based Transfer Learning (clause 6.2b.2.X1.2.1) |
| **REQ-MLKTL-2** | The 3GPP management systemshould have a capability for an MLKTL MnS producer to provide to an authorized MnS consumer all or part of its available shareable knowledge | ML-Knowledge-based Transfer Learning (clause 6.2b.2.X1.2.1) |
| **REQ-MLKTL-3** | The 3GPP management systemshould have a capability enabling an authorized MnS consumer to request a MLKTL MnS producer to initiate and execute a transfer learning instance to a specified ML model or ML-enabled function | ML-Knowledge-based Transfer Learning (clause 6.2b.2.X1.2.2) |
| **REQ-MLKTL-4** | The 3GPP management systemshould have a capability to enable an authorized MnS consumer to manage or control the knowledge request or the knowledge process or transfer learning process, e.g. to suspend, re-activate or cancel the ML Knowledge Request; or to adjust the description of the desired knowledge  NOTE: An example MnS consumers include an operator or the function that generated the request for available Knowledge | ML-Knowledge-based Transfer Learning (clause 6.2b.2.X1.2.2) |
| **REQ-MLKTL-5** | The 3GPP management systemshould have a capability to enable an ML model or ML training function to register available knowledge to a shared knowledge repository, e.g. through a ML Knowledge Registration process | ML-Knowledge-based Transfer Learning (clause 6.2b.2.X1.2.2) |
| **REQ-MLKTL-6** | The 3GPP management systemshould have a capability enabling an authorized MnS consumer to request the Knowledge Repository to provide some or all the knowledge available for sharing based on specific criteria | ML-Knowledge-based Transfer Learning (clause 6.2b.2.X1.2.2) |
| **REQ-ML\_TRAIN\_CLUSTER-01** | The ML Training MnS producer should have a capability for an authorized MnS consumer to request training of a cluster of ML models as per clustering criteria associated to a set of multiple contexts from a previously trained ML model. | ML model training for multiple contexts (clause 6.2b.2.X2) |
| **REQ-ML\_TRAIN-PRE-01** | The ML training MnS producer should have a capability allowing an authorized ML training MnS consumer to request pre-specialized training of a ML model. | ML Pre-specialised training (clause 6.2b.2.X3) |
| **REQ-ML\_DIST-TRNG-01** | The ML training MnS producer should have a capability allowing and authorized consumer to provide distributed training requirements to the MnS Producer. | Management of Distributed training (clause 6.2b.2.X5) |
| **REQ-ML\_TRAIN\_FL-1** | The ML training MnS producer should have a capability allowing an authorized consumer to discover the FL roles (FL server or FL client) in Federated Learning. | Management of different roles in Federated Learning (Clause 6.2b.2.X6.2.1) |
| **REQ-ML\_TRAIN\_FL-2** | The ML training MnS producer should have a capability allowing an authorized consumer to provide FL training requirements to the MnS Producer. | Management of different roles in Federated Learning (Clause 6.2b.2.X6.2.1) |
| **REQ-ML\_TRAIN\_FL-3** | The ML training MnS producer should have a capability allowing an authorized consumer to provide requirements for selecting (including adding and removing) FL clients in Federated Learning to the MnS Producer. | Management of different roles in Federated Learning (Clause 6.2b.2.X6.2.1) |
| **REQ-ML\_TRAIN\_FL-4** | The ML training MnS producer should have a capability allowing an authorized consumer to get the performance of the global ML model on each participating FL Client. | Management of different roles in Federated Learning (Clause 6.2b.2.X6.2.1) |
| **REQ-ML\_TRAIN\_FL-5** | The ML training MnS producer should have a capability to report the information about the contribution of each FL client to the FL process to MnS consumer. | Management of different roles in Federated Learning (Clause 6.2b.2.X6.2.1) |
| **REQ-ML\_TRAIN\_FL-6** | The ML training MnS producer should have a capability to report the candidate FL Clients for the FL process. | Management of different roles in Federated Learning (Clause 6.2b.2.X6.2.1) |
| **REQ-RL\_TRAIN\_01** | The ML training MnS producer should have a capability allowing an authorized MnS consumer to query if RL training is supported. | Enabling Reinforcement Learning (6.2b.2.X7.2.1) |
| **REQ-RL\_TRAIN\_02** | The ML Training MnS producer for should have a capability to report RL types (i.e., online RL, offline RL) to an authorized consumer. | Enabling Reinforcement Learning (6.2b.2.X7.2.1) |
| **REQ-RL\_TRAIN\_03** | The ML Training MnS producer for should have a capability to allow an authorized consumer to get the type and scope of the RL environment for which an RL model has been trained. | Exploration in Reinforcement Learning (6.2b.2.X7.2.2) |
| **REQ-RL\_TRAIN\_04** | The ML Training MnS producer for should have a capability to allow an authorized consumer to select the type of the RL environment for which an RL model is to be trained. | Exploration in Reinforcement Learning (6.2b.2.X7.2.2) |
| **REQ-RL\_TRAIN\_05** | The ML Training MnS producer for should have a capability to allow an authorized consumer to provide the scope of the RL environment for which an RL model is to be trained. | Exploration in Reinforcement Learning (6.2b.2.X7.2.2) |
| **REQ-RL\_TRAIN\_06** | The ML training MnS producer should have a capability allowing an authorized MnS consumer to provide network performance requirements of performing RL training. | Exploration in Reinforcement Learning (6.2b.2.X7.2.2) |
| **REQ-RL\_TRAIN\_07** | The ML training MnS producer should have a capability to allow an authorized MnS consumer to specify the configuration range that the RL agent is allowed to explore. | Exploration in Reinforcement Learning (6.2b.2.X7.2.2) |
| **REQ-RL\_TRAIN\_08** | The ML Training MnS producer should have a capability to allow an authorized consumer to provide the allowed scope for the entities to be impacted by the RL actions. | Exploration in Reinforcement Learning (6.2b.2.X7  .2) |
| **REQ-ML\_TRAIN\_DST-01** | The 3GPP management system should enable an authorized consumer to provide information on the training dataset distribution. | Training data statistics (clause 6.2b.2.X8) |
| **REQ-ML\_TRAIN\_DST-02** | The 3GPP management system should enable an authorized consumer to provide information on the usage of outliers in the training dataset. | Training data statistics (clause 6.2b.2.X8) |
| **REQ-ML\_RL\_MGMT-1** | The ML training MnS producer should have a capability to provide the training conflict indication to authorized MnS consumer. | Training Conflict Management for Reinforcement Learning (clause 6.2b.2.16.2.X) |
| NOTE: The performance measurements and KPIs are specific to each type (i.e., the inference type that the ML model supports) of ML model. | | |

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| **End of changes** |