**3GPP TSG-CT WG3 Meeting #142C3-253293**

**Gothenburg, SE, 25 - 29 August 2025**

**Source: Samsung**

**Title: Pseudo-CR on data model definition for AIMLES\_MLModelTraining API.**

**Spec: 3GPP TS 29.482**

**Agenda item: 19.41**

**Document for: Decision**

**1. Introduction**

The pseudo CR defines the data model for AIMLES\_MLModelTraining API.

**2. Reason for Change**

The data model for AIMLES\_MLModelTraining API is FFS. This CR defines the data model for the API.

**3. Conclusions**

N/A

**4. Proposal**

It is proposed to agree the following changes to 3GPP TS 29.482 v1.0.0.

\* \* \* First Change \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 29.122: "T8 reference point for Northbound Application Programming Interfaces (APIs)".

[3] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[4] OpenAPI: "OpenAPI Specification Version 3.0.0", <https://spec.openapis.org/oas/v3.0.0>.

[5] 3GPP TR 21.900: "Technical Specification Group working methods".

[6] 3GPP TS 23.222: "Common API Framework for 3GPP Northbound APIs; Stage 2".

[7] 3GPP TS 29.222: "Common API Framework for 3GPP Northbound APIs; Stage 3".

[8] 3GPP TS 33.122: "Security aspects of Common API Framework (CAPIF) for 3GPP northbound APIs".

[9] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

[10] IETF RFC 9113: "HTTP/2".

[11] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[12] IETF RFC 9457: "Problem Details for HTTP APIs".

[13] 3GPP TS 23.482: "Functional architecture and information flows for AIML Enablement Service".

[14] 3GPP TS 29.549: "Service Enabler Architecture Layer for Verticals (SEAL); Application Programming Interface (API) specification; Stage 3".

[15] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[16] 3GPP TS 24.560: "Artificial Intelligence Machine Learning (AIML) Services - Service Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3".

[17] 3GPP TS 23.434: "Service Enabler Architecture Layer for Verticals (SEAL); Functional architecture and information flows".

[18] 3GPP TS 29.572: "5G System; Location Management Services; Stage 3".

[19] 3GPP TS 29.558: "5G System; Enabling Edge Applications; Application Programming Interface (API) specification; Stage 3".

\* \* \* Second Change \* \* \* \*

#### 6.1.8.6 Data Model

##### 6.1.8.6.1 General

This clause specifies the application data model supported by the API.

Table 6.1.8.6.1-1 specifies the data types defined for the AIMLES\_MLModelTraining API.

Table 6.1.8.6.1-1: AIMLES\_MLModelTraining API specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Clause defined | Description | Applicability |
| AccessType | 6.1.8.6.3.7 | Represents the access type for ML model. |  |
| AccessReqInfo | 6.1.8.6.2.11 | Represents the information for accessing the ML model. |  |
| MemberInfo | 6.1.8.6.2.7 | Represents the list of AIMLE clients selected or de-selected for the ML model training. |  |
| MemberSelCriteria | 6.1.8.6.2.4 | Represents the criteria to be continuously monitored for selecting the member clients. |  |
| MlModelInfo | 6.1.8.6.2.5 | Represents the ML model that has to be distributed to the selected member clients for training |  |
| MlModelReqInfo | 6.1.8.6.2.6 | Represents the requirement for selecting a model to be trained and this information contains the filtering criteria for selecting the model. |  |
| MlModelTrainNotif | 6.1.8.6.2.3 | Represents the ML Model training notification |  |
| ModelDomain | 6.1.8.6.3.6 | Represents the domain for which the model can be used. |  |
| ModelPhase | 6.1.8.6.3.4 | Represents the ML model phase, e.g., in training, trained, re-training, deployed. |  |
| ModelPhaseInfo | 6.1.8.6.2.9 | Represents the information regarding ML model phase, e.g., observed performance, training information. |  |
| ModelStorageReq | 6.1.8.6.2.10 | Represents the requirements for the ML repository for the ML model storage and discovery. |  |
| TrainingOutput | 6.1.8.6.2.8 | Represents the output of training, e.g., ML model parameters for the training. |  |
| TrainRequest | 6.1.8.6.2.2 | Represents the ML Model training request |  |
| TrainingType | 6.1.8.6.3.3 | Represents whether the VFL or HFL training to be performed. |  |
| TrainingErr | 6.1.8.6.3.5 | Represents the errors, if any, encountered during training process. |  |

Table 6.1.8.6.1-2 specifies data types re-used by the AIMLES\_MLModelTraining API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the AIMLES\_MLModelTraining API.

Table 6.1.8.6.1-2: AIMLES\_MLModelTraining API re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| LocationArea5G | 3GPP TS 29.122 [5] | Used to indicate a location area represented as list of geographic areas, civic addresses and network area. |  |
| Uri | 3GPP TS 29.122 [2] | Represent an URI, used to indicate the notification URI. |  |
| ClientCapability | 3GPP TS 29.560 [16] | Represents the client capability information. |  |
| TimeWindow | 3GPP TS 29.122 [3] | Indicates the time window. |  |
| Endpoint | 3GPP TS 29.558 [19] | Represents the endpoint information. |  |
| Float | 3GPP TS 29.571 [15] | Used to represent the fractional part of the proximity range in the reference UE details. |  |
| VendorId | 3GPP TS 29.510 [12] | Represents the Vendor ID. |  |

##### 6.1.8.6.2 Structured data types

6.1.8.6.2.1 Introduction

This clause defines the structures to be used in resource representations.

###### 6.1.8.6.2.2 Type: TrainRequest

Table 6.1.8.6.2.2-1: Definition of type TrainRequest

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| trnType | TrainingType | M | 1 | Contains the type of training to be performed. |  |
| members | array(AimleClientId) | C | 1..N | Contains the list of member clients to be utilized for training the ML model.(NOTE 1) |  |
| memSelCrit | MemberSelCriteria | C | 0..1 | Contains the criteria that needs to be continuously monitored for selecting the member clients.(NOTE 1) |  |
| modelInf | MlModelInfo | C | 0..1 | Contains the ML model that has to be distributed to the selected member clients for training.(NOTE 2) |  |
| modelReq | MlmodelReqInfo | C | 0..1 | Contains the requirement for selecting a model to be trained and the filtering criteria for selecting the model.(NOTE 2) |  |
| memUpdNotif | Boolean | O | 0..1 | Indicates whether the requestor needs to be notified whenever there is update related to new member clients selected or de-selected.Set to "true" to indicate that requestor needs to be notified whenever there is update related to new member clients selected or de-selected. Default value is "false" if omitted. |  |
| notifUri | Uri | C | 0..1 | Contains the notification URI where notifications should be sent.This attribute shall be present when the attribute "memUpdNotif" is set to "true". |  |
| NOTE 1: At least one of these attributes shall be present.NOTE 2: At least one of these attributes shall be present. |

Editor's note: It is FFS, if reporting requirements are applicable to this data type.

###### 6.1.8.6.2.3 Type: MlModelTrainNotif

Table 6.1.8.6.2.3-1: Definition of type MlModelTrainNotif

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| members | array(MemberInfo) | C | 1..N | Contains the list of AIMLE clients selected or de-selected for the ML model training.(NOTE) |  |
| trainOut | PerfParams | C | 0..1 | Contains the output of training, e.g., ML model parameters for the training.(NOTE) |  |
| trainErr | TrainingErr | C | 0..1 | Contains the list of errors, if any, encountered during training process.(NOTE) |  |
| NOTE: At least one of these attributes shall be present. |

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###### 6.1.8.6.2.4 Type: MemberSelCriteria

Table 6.1.8.6.2.4-1: Definition of type MemberSelCriteria

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| clientLoc | LocationArea5G | C | 0..1 | Contains the location of the AIMLE client for the AIML service that needs to be monitored. |  |
| clientAvailability | TimeWindow | C | 0..1 | Contains the required availability duration of the AIMLE client. |  |
| clientCapability | ClientCapability | C | 0..1 | Contains the required client capability information. |  |
| NOTE: At least one of these attributes shall be present. |

###### 6.1.8.6.2.5 Type: MlModelInfo

Table 6.1.8.6.2.5-1: Definition of type MlModelInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| mlModelId | string | C | 0..1 | Contains the identifier for ML model. |  |
| mlModelLoc | Endpoint | C | 0..1 | Contains the URI, fqdn or address that maps to the resource where ML model is stored. |  |
| NOTE: At least one of these attributes shall be present. |

###### 6.1.8.6.2.6 Type: MlModelReqInfo

Table 6.1.8.6.2.6-1: Definition of type MlModelReqInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| mlModelId | string | M | 1 | Contains the identifier for the ML model. |  |
| adaeAnalyticsId | string | C | 0..1 | Contains the ADAE analytics ID for which the model can be used. (NOTE) |  |
| mlModelSize | Uinteger | C | 0..1 | Represents the model size in bytes.(NOTE) |  |
| mlModelSource | nodeId | C | 0..1 | Contains the node ID which is the source that stored the ML model in the ML repository.(NOTE) |  |
| valServiceId | string | C | 0..1 | Contains the identifier for the VAL service.(NOTE) |  |
| modelDomain | ModelDomain | C | 0..1 | Contains the domain for which the model can be used.(NOTE) |  |
| vendorList | Array(VendorId) | C | 0..N | Contains the list of vendors that are allowed to use the ML model.(NOTE) |  |
| modelPhaseInfo | ModelPhaseInfo | C | 0..1 | Contains the ML model phase information.(NOTE) |  |
| mlModelReq | ModelStorageReq | C | 0..1 | Contains the requirements for ML repository for ML model storage and discovery.(NOTE) |  |
| mlModelUsageReq | AimleOperation | C | 0..1 | Contains the requirements for using the ML model.(NOTE) |  |
| NOTE: At least one of these attributes shall be present. |

###### 6.1.8.6.2.7 Type: MemberInfo

Table 6.1.8.6.2.7-1: Definition of type MemberInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| clientSel | boolean | C | 0..1 | Indicates whether the AIMLE client is selected or not.0 represents the client is not selected. 1 represents the client is selected. |  |
| clientUri | Uri | C | 0..1 | Contains the URI information of the AIMLE clients. |  |
| NOTE: At least one of these attributes shall be present. |

###### 6.1.8.6.2.8 Type: PerfParam

Table 6.1.8.6.2.8-1: Definition of type PerfParam

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| modelAccuracy | integer | C | 0..1 | Indicates the achieved ML model accuracy, expressed as a percentage.Minimum: 0, maximum: 100. |  |
| modelPrecision | Float | C | 0..1 | Represents the accuracy for the positive predictions made by the model.Minimum: 0, maximum: 1. |  |
| modelRecall | Float | C | 0..1 | Represents model's ability to identify all the actual positive instances within a dataset.Minimum: 0, maximum: 1. |  |
| modelF1Score | Float | C | 0..1 | Represents the combined metric for precision and recall.Minimum: 0, maximum: 1. |  |
| errorMeanSquare | Float | C | 0..1 | Represents the mean squared error between predicted values and actual values. |  |
| errorMeanAbs | Float | C | 0..1 | Represents the mean absolute error between predicted values and actual values. |  |
| NOTE: At least one of these attributes shall be present. |

###### 6.1.8.6.2.9 Type: ModelPhaseInfo

Table 6.1.8.6.2.9-1: Definition of type ModelPhaseInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| modelPhase | ModelPhase | C | 0..1 | Contains the ML model phase. |  |
| obsPerf | PerfParam | C | 0..1 | Contains information on model performance.This attribute shall be present if ModelPhase is “TRAINED” or “DEPLOYED”. |  |
| trainingInfo | TrainingInfo | C | 0..1 | Contains information on the data that has been used to train the model.This attribute shall be present if ModelPhase is “TRAINED” or “DEPLOYED”. |  |
| indContModel | boolean | C | 0..1 | Indicates whether model can be continuously trained or not.0 indicates model cannot be continuously trained.1 indicates model can be continuously trained.This attribute shall be present if ModelPhase is “TRAINING” or “RETRAINING”. |  |
| paramContModel | ParamContModel | C | 0..1 | Contains the information regarding parameters for continuous model training.This attribute shall be present if ModelPhase is “TRAINING” or “RETRAINING”. |  |
| NOTE: At least one of these attributes shall be present. |

###### 6.1.8.6.2.10 Type: ModelStorageReq

Table 6.1.8.6.2.10-1: Definition of type ModelStorageReq

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| storageDuration | TimeWindow | C | 0..1 | Contains the ML model storage duration time. |  |
| secuReq | string | C | 0..1 | Contains the security requirement for ML model information.  |  |
| accessReq | AccessReqInfo | C | 0..1 | Contains the ML model access requirements. |  |
| NOTE: At least one of these attributes shall be present. |

###### 6.1.8.6.2.11 Type: AccessReqInfo

Table 6.1.8.6.2.10-1: Definition of type AccessReqInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| accessType | AccessType | C | 0..1 | Contains the access type for ML model. |  |
| valServIds | array(string) | C | 0..1 | Contains the VAL server IDs that can access the ML model. This shall be present when the access type is CONDITIONAL. |  |
| valClientIds | array(string) | C | 0..1 | Contains the VAL client IDs that can access the ML model. This shall be present when the access type is CONDITIONAL. |  |
| timePeriod | TimeWindow | C | 0..1 | Contains the time period for accessing the ML model. This shall be present when the access type is CONDITIONAL. |  |
| locAccess | LocationArea5G | C | 0..1 | Contains the location area for accessing the ML model. This shall be present when the access type is CONDITIONAL. |  |
| NOTE: At least one of these attributes shall be present. |

###### 6.1.8.6.2.12 Type: TrainingInfo

Table 6.1.8.6.2.12-1: Definition of type TrainingInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| dataSource | Endpoint | C | 0..1 | Contains the end point information for the data source.(NOTE 1) |  |
| dataSize | Uinteger | C | 0..1 | Contains the size of the data in bytes.(NOTE 1) |  |
| dataRecency | DateTime | C | 0..1 | Contains the date and time on which the data was last updated.(NOTE 1) |  |
| baseModelId | string | C | 0..1 | Contains the base model ID.(NOTE 2) |  |
| NOTE 1: At least one of these attributes shall be present.NOTE 2: This attribute shall be present in case of Transfer Learning.  |

###### 6.1.8.6.2.13 Type: ParamContModel

Table 6.1.8.6.2.13-1: Definition of type ParamContModel

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| retrainParam | string | C | 0..1 | The performance parameter used for monitoring continuous model training. The parameter can be F1 score, accuracy, data drift, etc. |  |
| retrainThres | Uinteger | C | 0..1 | The threshold value below which the model needs to be retrained.  |  |
| NOTE: At least one of these attributes shall be present. |

##### 6.1.8.6.3 Simple data types and enumerations

###### 6.1.8.6.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

###### 6.1.8.6.3.2 Simple data types

The simple data types defined in table 6.1.8.6.3.2-1 shall be supported.

Table 6.1.8.6.3.2-1: Simple data types

|  |  |  |  |
| --- | --- | --- | --- |
| Type Name | Type Definition | Description | Applicability |
| AimleModelId | string | Represents the ML model identifier. |  |

###### 6.1.8.6.3.3 Enumeration: TrainingType

The enumeration TrainingType represents the type training requested. It shall comply with the provisions defined in table 6.1.8.6.3.3-1.

Table 6.1.8.6.3.3-1: Enumeration TrainingType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| TRAIN\_VFL | Indicates that the training type is horizontal federated learning |  |
| TRAIN\_HFL | Indicates that the training type is vertical federated learning |  |

###### 6.1.8.6.3.4 Enumeration: ModelPhase

The enumeration ModelPhase represents the ML model training phase. It shall comply with the provisions defined in table 6.1.8.6.3.4-1.Table 6.1.8.6.3.4-1: Enumeration ModelPhase

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| TRAINING | Indicates that the model is in training phase. |  |
| TRAINED | Indicates that the model is trained. |  |
| RETRAINING | Indicates that the model is in retraining phase. |  |
| DEPLOYED | Indicates that the model is deployed. |  |

###### 6.1.8.6.3.5 Enumeration: TrainingErr

The enumeration TrainingErr represents the training error encountered during ML model training. It shall comply with the provisions defined in table 6.1.8.6.3.5-1.

Table 6.1.8.6.3.5-1: Enumeration TrainingErr

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| UNDERFITTING | Indicates that the trained model is underfitting the training data. |  |
| OVERFITTING | Indicates that the trained mode is overfitting the training data. |  |
| PERFORMANCE\_ERRORS | Indicates that the trained model is unable to meet the desired performance. |  |
| DATA\_LEAKAGE | Indicates that there is data leakage from evaluation data set to the training data. |  |

###### 6.1.8.6.3.6 Enumeration: ModelDomain

The enumeration ModelDomain represents the domain for which the model can be used. It shall comply with the provisions defined in table 6.1.8.6.3.6-1.

Table 6.1.8.6.3.6-1: Enumeration ModelDomain

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| SPEECH\_RECOGNITION | Indicates that the model can be used for speech recognition related applications. |  |
| IMAGE\_RECOGNITION | Indicates that the model can be used for image recognition related applications. |  |
| VIDEO\_PROCESSING | Indicates that the model can be used for video processing. |  |
| LOCATION\_PREDICTION | Indicates that the model can be used for location prediction. |  |

###### 6.1.8.6.3.7 Enumeration: AccessType

The enumeration AccessType represents the domain for which the model can be used. It shall comply with the provisions defined in table 6.1.8.6.3.7-1.

Table 6.1.8.6.3.7-1: Enumeration AccessType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| PUBLIC | Indicates that ML model is publicly available. |  |
| PRIVATE | Indicates that ML model is private. |  |
| CONDITIONAL | Indicates that ML model is available for the list of VAL server or VAL client IDs. |  |

\* \* \* End of Changes \* \* \* \*