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# Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

- shall** indicates a mandatory requirement to do something
- shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

- should** indicates a recommendation to do something
- should not** indicates a recommendation not to do something
- may** indicates permission to do something
- need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

- can** indicates that something is possible
- cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

- will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

---

# 1 Scope

The present document specifies the stage 3 protocol and data model for the AI/ML enabling SEAL services. It provides stage 3 protocol definitions and message flows and specifies the API for each service offered by the AIMLE server.

The stage 2 architecture and procedures are specified in 3GPP TS 23.482 [4].

The common protocol and interface aspects for API definition are specified in clause 5.2 of 3GPP TS 29.122 [5].

The present document is applicable to the user equipment (UE) supporting AI/ML enabling SEAL services functionalities as described in 3GPP TS 23.482 [4], to the application server supporting AI/ML enabling SEAL services functionalities as described in 3GPP TS 23.482 [4], and to the application server supporting the vertical application server (VAL server) functionality as defined in specific vertical application service (VAL service) specification.

NOTE: The specification of the VAL server for a specific VAL service is out of the scope of the present document.

---

# 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 21.900: "Technical Specification Group working methods".
- [2] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [3] 3GPP TS 23.222: "Common API Framework for 3GPP Northbound APIs; Stage 2".
- [4] 3GPP TS 23.482: "Functional architecture and information flows for AIML Enablement Service".
- [5] 3GPP TS 29.122: "T8 reference point for Northbound Application Programming Interfaces (APIs)".
- [6] 3GPP TS 29.222: "Common API Framework for 3GPP Northbound APIs; Stage 3".
- [7] 3GPP TS 29.482: "Service Enabler Architecture Layer for Verticals (SEAL); Artificial Intelligence Machine Learning Enablement (AIMLE) Services; Stage 3".
- [8] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".
- [9] 3GPP TS 29.549: "Service Enabler Architecture Layer for Verticals (SEAL); Application Programming Interface (API) specification".
- [10] 3GPP TS 29.558: "Enabling Edge Applications; Application Programming Interface (API) specification; Stage 3".
- [11] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".
- [12] 3GPP TS 33.122: "Security aspects of Common API Framework (CAPIF) for 3GPP northbound APIs".
- [13] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".
- [14] OpenAPI: "OpenAPI Specification Version 3.0.0", <https://spec.openapis.org/oas/v3.0.0>.

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [2] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [2].

**AIMLE client:** An AI/ML enablement layer entity (see 3GPP TS 23.482 [4] clause 5) which is an AI/ML endpoint, and performs client-side operations.

**AI/ML intermediate model:** An AI/ML intermediate model defined in 3GPP TS 23.482 [4].

**AI/ML operation:** An AI/ML operation defined in 3GPP TS 23.482 [4].

**AIMLE server:** An AI/ML enablement layer entity (see 3GPP TS 23.482 [4] clause 5) which is an AI/ML endpoint, and performs server-side operations.

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.434 [3] apply:

**SEAL service**  
**VAL client**  
**VAL server**  
**VAL service**  
**Vertical**  
**Vertical application**

For the purposes of the present document, the following terms and definitions given in 3GPP TS 23.482 [4] apply:

**AIMLE service**  
**FL member**  
**FL client**  
**FL server**

### 3.2 Symbols

For the purposes of the present document, the following symbols apply:

### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [2] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [2].

ADAE	Application Data Analytics Enablement
AI/ML	Artificial Intelligence / Machine Learning
AIMLE	AI/ML Enablement
API	Application Programming Interface
AS	Application Server
CAPIF	Common API Framework
FL	Federated Learning
HFL	Horizontal Federated Learning
ML	Machine Learning
SCEF	Service Capability Exposure Function
SCS	Services Capability Server
SEAL	Service Enabler Architecture Layer for verticals
TL	Transfer Learning
VAL	Vertical Application Layer
VFL	Vertical Federated Learning

---

## 4 General

### 4.1 Overview

Artificial intelligence machine learning enablement (AIMLE) SEAL services enable the AIMLE server to communicate with the AIMLE client over the AI/ML-UU reference points. The detailed specification of AIMLE is provided in 3GPP TS 23.482 [4].

The present document specifies the APIs in detail, needed to support the AIMLE services offered by the AIMLE client and the AIMLE services offered by the AIMLE server.

---

## 5 Artificial intelligence machine learning services

### 5.1 Introduction

Table 5.1-1 summarizes the corresponding APIs defined for this specification.

Table 5.1-1: API descriptions

Service Name	Clause	Description	OpenAPI specification File	API name	Annex
Aimlec_AIMLEClientParticipation	5.2	AIMLE client participation service	TS24560_Aimlec_AIMLEClientParticipation.yaml	aimlec-cp	A.2
Aimlec_HFLTraining	5.3	AIMLE client HFL training service	TS24560_Aimlec_HFLTraining.yaml	aimlec-hfl-trng	A.3
Aimles_AIMLEClientRegistration	5.4	AIMLE client registration service	TS24560_Aimles_AIMLEClientRegistration.yaml	aimles-client-reg	A.4
Aimles_SplitOpEvent	5.5	AIMLE server split operation event	TS29482_Aimles_SplitOpEvent.yaml	aimles-splitopevent	NOTE
Aimles_SplitOpPipeline	5.6	AIMLE server split operation pipeline	TS24560_Aimles_SplitOpPipeline.yaml	aimles-sopl	A.5
Aimlec_FLGroupIndication	5.7	AIMLE client FL group indication service	TS24560_Aimlec_FLGroupIndication.yaml	aimlec-flgi	A.6
Aimlec_ClientDataProcessing	5.8	AIMLE client data processing service	TS24560_Aimlec_ClientDataProcessing.yaml	aimlec-data-proc	A.7
Aimlec_MLModTngCapEva	5.9	ML model training capability evaluation service	TS24560_Aimlec_MLModTngCapEva.yaml	aimlec-ml-mtce	A.8
Aimles_UeTLModelSelectionAssistance	5.10	TL enablement service	TS24560_Aimles_UeTLModelSelectionAssistance.yaml	aimles-ue-tl-msa	A.9
Aimlec_AIMLEClientServiceOperations	5.11	AIMLE client service operations service	TS24560_Aimlec_AIMLEClientServiceOperations.yaml	aimlec-serv-ops	A.10
Aimlec_AimlTaskTransfer	5.12	AIMLE client AI/ML task transfer service	TS24560_Aimlec_AimlTaskTransfer.yaml	aimlec-task-transfer	A.11
Aimles_AimlTaskTransfer	5.13	AIMLE server AI/ML task transfer service	TS24560_Aimles_AimlTaskTransfer.yaml	aimles-task-transfer	A.12
Aimles_MLModelRetrieval	5.14	AIMLE server ML model retrieval	TS29482_Aimles_MLModelRetrieval.yaml	aimles-mlmr	NOTE
Aimles_MLModelUpdate	5.15	AIMLE client ML model update	TS29482_Aimles_MLModelUpdate.yaml	aimles-mlmupd	NOTE

NOTE: The API and OpenAPI are defined in 3GPP TS 29.482 [7].

NOTE: When 3GPP TS 29.122 [5] is referenced for the common protocol and interface aspects for API definition in the clauses under clause 5, the AIMLE service producer (AIMLE server or AIMLE client) takes the role of the SCEF and the AIMLE service consumer (AIMLE client or AIMLE server) takes the role of the SCS/AS.

## 5.2 AIMLE client participation service

### 5.2.1 Service description

The AIMLE client participation service enables the AIMLE server to verify and manage the participation of AIMLE clients in AI/ML operations as defined in 3GPP TS 23.482 [4].

### 5.2.2 Service operations

#### 5.2.2.1 Introduction

The service operation defined for Aimlec\_AIMLEClientParticipation API is shown in the table 5.2.2.1-1.

**Table 5.2.2.1-1: Operations of AIMLE client participation service**

Service operation name	Description	Initiated by
Aimlec_AIMLEClientParticipation_Request	This service operation is used by the AIMLE server to request for participation of the AIMLE client for the AI/ML operations.	AIMLE server

#### 5.2.2.2 Aimlec\_AIMLEClientParticipation\_Request

##### 5.2.2.2.1 General

The Aimlec\_AIMLEClientParticipation\_Request service operation is used by AIMLE server to verify and manage the participation of AIMLE clients in AI/ML operations.

##### 5.2.2.2.2 AIMLE client participation service operation

To manage the AIMLE client for AI/ML operations, the AIMLE server shall send an HTTP POST request (custom operation: "Participation for AI/ML operations") with a Request-URI set to "{apiRoot}/aimlec-cp/<apiVersion>/participation" and the request body including the AimlecParticipationReq data structure as specified in clause 6.1.6.2.2.

Upon receipt of the HTTP POST request:

- a) the AIMLE client shall verify the identity of the AIMLE server and determine if the AIMLE server is authorized to request the AIMLE client to participate to the AI/ML operations; and
- b) if the AIMLE server:
  - 1) is not authorized, the AIMLE client shall respond to the AIMLE server with an appropriate error status code; or
  - 2) is authorized, the AIMLE client shall respond to the AIMLE server with:
    - i) if the HTTP POST request is handled successfully, an HTTP "200 OK" status code with the response body including the AimlecParticipationResp data structure as specified in clause 6.1.6.2.3; or
    - ii) if the HTTP POST request is not handled successfully, an appropriate error response as specified in clause 6.1.7.

The AIMLE client may respond to the AIMLE server with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the request shall be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.3 HFL training service

### 5.3.1 Service description

The Horizontal Federated Learning (HFL) training service enables the AIMLE server to configure training schedule for one or more AIMLE clients and subscribe to HFL training as defined in 3GPP TS 23.482 [4].

### 5.3.2 Service operations

#### 5.3.2.1 Introduction

The service operation defined for Aimlec\_HFLTraining API is shown in the table 5.3.2.1-1.

**Table 5.3.2.1-1: Operations of HFL training service**

Service operation name	Description	Initiated by
Aimlec_HFLTraining_Subscribe	This service operation allows a service consumer to create an HFL training subscription.	e.g. AIMLE server
Aimlec_HFLTraining_Retrieve	This service operation allows a service consumer to retrieve an existing individual HFL training subscription.	e.g. AIMLE server
Aimlec_HFLTraining_Update	This service operation allows a service consumer to update an existing individual HFL training subscription.	e.g. AIMLE server
Aimlec_HFLTraining_Unsubscribe	This service operation allows a service consumer to delete an existing individual HFL training subscription.	e.g. AIMLE server
Aimlec_HFLTraining_Notify	This service operation allows a service consumer to receive HFL training notifications.	AIMLE client

#### 5.3.2.2 Aimlec\_HFLTraining\_Subscribe

##### 5.3.2.2.1 General

This service operation is used by a service consumer e.g. the AIMLE server to subscribe with the AIMLE client for HFL training event.

##### 5.3.2.2.2 AI/ML operation for HFL training subscription

To subscribe to the HFL training event with the AIMLE client, the AIMLE server shall send to the AIMLE the HTTP POST request containing the HflTrngSub data type as specified in clause 6.2.6.2.2.

Upon receipt of the HTTP POST request from the AIMLE server, the AIMLE client shall verify the identity of the AIMLE server and determine if the AIMLE server is authorized for the request. If the AIMLE server:

- a) is not authorized to subscribe to the HFL training event, the AIMLE client shall respond to the AIMLE server with an appropriate error status code as specified in clause 6.2.7; or
- b) is authorized to subscribe to the HFL training event, the AIMLE client shall:
  - 1) create the HFL training event subscription and store the subscription information; and
  - 2) respond the AIMLE server by including in the response:
    - i) an HTTP "Location" header containing the URI of the newly created resource; and
    - ii) the HflTrngSub data type as specified in clause 6.2.6.2.2.

### 5.3.2.3 Aimlec\_HFLTraining\_Retrieve

#### 5.3.2.3.1 General

This service operation is used by a service consumer e.g. the AIMLE server to retrieve an existing individual HFL training event subscription with the AIMLE client.

#### 5.3.2.3.2 AI/ML operation for HFL training subscription retrieval

To retrieve an individual HFL training event subscription with the AIMLE client, the AIMLE server shall send the HTTP GET request to the AIMLE client.

Upon receipt of the HTTP GET request from the AIMLE server, the AIMLE client shall verify the identity of the AIMLE server and determine if the AIMLE server is authorized for the request. If the AIMLE server:

- a) is not authorized to retrieve the existing individual HFL training event subscription, the AIMLE client shall respond to the AIMLE server with an appropriate error status code as specified in clause 6.2.7; or
- b) is authorized to retrieve the existing individual HFL training event subscription, the AIMLE client shall include the HflTrngSub data type as specified in clause 6.2.6.2.2 in the response.

The AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the request shall be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

### 5.3.2.4 Aimlec\_HFLTraining\_Update

#### 5.3.2.4.1 General

This service operation is used by a service consumer e.g. the AIMLE server to update an existing individual HFL training event subscription with the AIMLE client.

#### 5.3.2.4.2 AI/ML operation for HFL training subscription update

To update an existing individual HFL training event subscription with the AIMLE client, the AIMLE server shall send to the AIMLE client:

- the HTTP PATCH request (for partial update) containing the HflTrngSubPatch data type as specified in clause 6.2.6.2.3; or
- the HTTP PUT request (for full replacement) containing the HflTrngSub data type as specified in clause 6.2.6.2.2.

Upon receipt of the HTTP PATCH request or HTTP PUT request from the AIMLE server, the AIMLE client shall verify the identity of the AIMLE server and determine if the AIMLE server is authorized for the request. If the AIMLE server:

- a) is not authorized to update the existing individual HFL training event subscription, the AIMLE client shall respond to the AIMLE server with an appropriate error status code as specified in clause 6.2.7; or
- b) is authorized to update the existing individual HFL training event subscription, the AIMLE client:
  - 1) shall update the existing individual HFL training event subscription with the updated subscription information; and
  - 2) may include the HflTrngSub data type as specified in clause 6.2.6.2.2 in the response.

The AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the request shall be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

### 5.3.2.5 Aimlec\_HFLTraining\_Unsubscribe

#### 5.3.2.5.1 General

This service operation is used by a service consumer e.g. the AIMLE server to unsubscribe an existing individual HFL training event subscription with the AIMLE client.

#### 5.3.2.5.2 AI/ML operation for HFL training unsubscription

To unsubscribe an existing individual HFL training event subscription with the AIMLE client, the AIMLE server shall send an HTTP DELETE request to the AIMLE client.

Upon receipt of the HTTP DELETE request from AIMLE server, the AIMLE client shall verify the identity of the AIMLE server and determine if the AIMLE server is authorized for the request. If the AIMLE server:

- a) is not authorized to unsubscribe for the existing individual HFL training event subscription, the AIMLE client shall respond to the AIMLE server with an appropriate error status code as specified in clause 6.2.7; or
- b) is authorized to update the existing individual HFL training event subscription, the AIMLE client shall:
  - 1) unsubscribe the existing individual HFL training event subscription; and
  - 2) respond to the AIMLE server with an HTTP "204 No Content" status code.

The AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the request shall be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

### 5.3.2.6 Aimlec\_HFLTraining\_Notify

#### 5.3.2.6.1 General

This service operation is used by the AIMLE client to notify a service consumer e.g. the AIMLE server, information about the HFL training event.

#### 5.3.2.6.2 AI/ML operation for HFL training notification

To notify about the HFL training event to the AIMLE server, the AIMLE client shall send to the AIMLE server an HTTP POST request containing the HflTrngNotify data type as specified in clause 6.2.6.2.4.

Upon receipt of the HTTP POST request from the AIMLE client, the AIMLE server shall verify the identity of the AIMLE client to determine that the AIMLE client is authorized for the request. Upon verification of the AIMLE client, the AIMLE server shall respond to the AIMLE client with:

- a) if the HTTP POST request is handled successfully, an HTTP "204 No Content" status code; or
- b) if the HTTP POST request is not handled successfully, an appropriate error response as specified in clause 6.2.7.

The AIMLE server may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE server towards which the request shall be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.4 AIMLE client registration service

### 5.4.1 Service description

The AIMLE client registration service enables the communication between the AIMLE client and the AIMLE server for AIMLE client registration operations as defined in 3GPP TS 23.482 [4]. The AIMLE client registration service is provided by the AIMLE server.

## 5.4.2 Service operations

### 5.4.2.1 Introduction

The service operations defined for the Aimles\_AIMLEClientRegistration API are shown in the table 5.4.2.1-1.

**Table 5.4.2.1-1: Operations for AIMLE client registration service**

Service operation name	Description	Initiated by
Aimles_AIMLEClientRegistration_Request	This service operation is used to request the AIMLE server to register the AIMLE client.	AIMLE client
Aimles_AIMLEClientRegistration_Update	This service operation is used to request the AIMLE server to update the AIMLE client registration information.	AIMLE client
Aimles_AIMLEClientRegistration_Delete	This service operation is used to request the AIMLE server to deregister the AIMLE client.	AIMLE client

### 5.4.2.2 Aimles\_AIMLEClientRegistration\_Request service operation

#### 5.4.2.2.1 General

The Aimles\_AIMLEClientRegistration\_Request service operation is used by the AIMLE client to register to the AIMLE server. The AIMLE server stores the AIMLE client information for future interactions e.g. to discover and select suitable AIMLE clients for requested AI/ML operations.

#### 5.4.2.2.2 AIMLE client registration request

To register itself at the AIMLE server, the AIMLE client shall send an HTTP POST request to the AIMLE server targeting the "AIMLE client registrations" collection resource, with the request body including the AimleClientRegInfo data structure as specified in clause 6.3.6.2.3.

Upon reception of the HTTP POST registration request, the AIMLE server shall perform an authentication and authorization check to determine if the AIMLE client is permitted to register to the AIMLE server and participate in AI/ML operations. If the AIMLE client:

- 1) is authorized to register at the AIMLE server, the AIMLE server shall:
  - a) create a new "Individual AIMLE client registration" resource with the received registration information; and
  - b) respond with an HTTP "201 Created" status code with the response body including the AimleRegistration data structure and an HTTP "Location" header field containing the URI of the created resource, as specified in clause 6.3.3.2.3.1; or
- 2) is not authorized to register at the AIMLE server, the AIMLE server shall take proper error handling actions, as specified in clause 6.3.7, and respond with an appropriate error status code.

If an "expTime" attribute indicating the expiration time for the AIMLE client registration was included in the AimleRegistration data structure as part of the created resource representation in step 1b above, then a periodic registration is required and to maintain the registration at the AIMLE server, the AIMLE client shall send a registration update request (as defined in clause 5.4.2.3) before the expiration of the current registration. If the AIMLE server did not receive the registration update request before the expiration of the current registration, then the AIMLE server shall delete the corresponding "Individual AIMLE client registration" resource.

**NOTE:** Upon successful authorization, the AIMLE server saves the context of the AIMLE client registration in the ML repository.

### 5.4.2.3 Aimles\_AIMLEClientRegistration\_Update service operation

#### 5.4.2.3.1 General

The Aimles\_AIMLEClientRegistration\_Update service operation is used by the AIMLE client to update its registration information at the AIMLE server.

#### 5.4.2.3.2 AIMLE client registration update

To update its registration information or invoke a reregistration at the AIMLE server, the AIMLE client shall send an HTTP PUT request to the AIMLE server targeting the "Individual AIMLE client registration" resource, as specified in clause 6.3.3.3.1, with the request body including the AimleRegistration data structure as specified in clause 6.3.6.2.2. The AIMLE client may update any data contained in the "suppProfiles" attribute and shall not update:

- 1) the expiration time for the AIMLE client registration contained in the "expTime" attribute;
- 2) the AIMLE client identifier contained in the "aimleClientId" attribute; and
- 3) a list of supported features contained in the "suppFeat" attribute.

Upon reception of the HTTP PUT request registration update request, the AIMLE server shall perform an authentication and authorization check to determine if the AIMLE client is permitted to update the targeted registration. If the AIMLE client:

- 1) is authorized update the targeted registration at the AIMLE server, the AIMLE server shall:
  - a) accordingly update the targeted "Individual AIMLE client registration" resource; and
  - b) respond with either:
    - an HTTP "204 No Content" status code if a periodic registration is not required; or
    - an HTTP "200 OK" status code with the response body including a representation of the updated resource within the AimleRegistration data structure; or
- 2) is not authorized update the targeted registration at the AIMLE server, the AIMLE server shall take proper error handling actions, as specified in clause 6.3.7, and respond with an appropriate error status code.

If the AIMLE server determined the received HTTP PUT request needs to be redirected, the AIMLE server may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE server towards which the HTTP PUT request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

If a periodic registration is required i.e. the "expTime" attribute indicating the expiration time for the AIMLE client registration was included in the AimleRegistration data structure in step 1b above, then to maintain the registration at the AIMLE server, the AIMLE client shall send the HTTP PUT registration update request (as described above) to update the registration prior to the expiration of the registration. If the AIMLE server did not receive the registration update request before the expiration of the registration, then the AIMLE server shall delete the corresponding "Individual AIMLE client registration" resource.

NOTE: Upon successful authorization, the AIMLE server saves the updated context of the AIMLE client registration in the ML repository.

### 5.4.2.4 Aimles\_AIMLEClientRegistration\_Delete service operation

#### 5.4.2.4.1 General

The Aimles\_AIMLEClientRegistration\_Delete service operation is used by the AIMLE client to deregister itself from the AIMLE server.

#### 5.4.2.4.2 AIMLE client deregistration

To deregister itself at the AIMLE server, the AIMLE client shall send an HTTP DELETE request to the AIMLE server targeting the "Individual AIMLE client registration" resource, as specified in clause 6.3.3.3.2.

Upon reception of the HTTP DELETE request, the AIMLE server shall perform an authentication and authorization check to determine if the AIMLE client is permitted to deregister at the AIMLE server. If the AIMLE client:

- 1) is authorized to deregister at the AIMLE server, the AIMLE server shall:
  - a) delete the corresponding "Individual AIMLE client registration" resource; and
  - b) respond with an HTTP "204 Not Content" status code; or
- 2) is not authorized to deregister at the AIMLE server, the AIMLE server shall take proper error handling actions, as specified in clause 6.3.7, and respond with an appropriate error status code.

If the AIMLE server determined the received HTTP DELETE request needs to be redirected, the AIMLE server may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE server towards which the HTTP DELETE request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.5 Split operation event subscription service

### 5.5.1 Service description

The split operation event subscription service enables an AIMLE client to subscribe, unsubscribe, and to update an existing subscription with the AIMLE server for events notification related to split AI/ML operation.

### 5.5.2 Service operations

#### 5.5.2.1 Introduction

The service operation defined for Aimles\_SplitOpEvent API is shown in the table 5.5.2.1-1.

**Table 5.5.2.1-1: Operations of split operation event subscription**

Service operation name	Description	Initiated by
Aimles_SplitOpEvent_Subscribe	This service operation is used by the AIMLE client to subscribe with the AIMLE server to be notified of events related to split AI/ML operation.	AIMLE client
Aimles_SplitOpEvent_Notify	This service operation is used by the AIMLE client to receive split operation notification from AIMLE server.	AIMLE server
Aimles_SplitOpEvent_UpdateSubscription	This service operation is used by the AIMLE client to update a subscription with the AIMLE server.	AIMLE client
Aimles_SplitOpEvent_Unsubscribe	This service operation is used by the AIMLE client to delete a subscription with the AIMLE server.	AIMLE client

#### 5.5.2.2 Aimles\_SplitOpEvent\_Subscribe

##### 5.5.2.2.1 General

This service operation is used by AIMLE client to subscribe with the AIMLE server to be notified of events related to split AI/ML operation.

### 5.5.2.2.2 AIMLE operation for split operation subscription

To subscribe with the AIMLE server for split operation event notification, the AIMLE client shall send an HTTP POST request to AIMLE server as specified in 3GPP TS 29.482 [7] in clause 6.1.12.3.2. The body of the POST message shall include the SplitOpEventSub data structure as specified in 3GPP TS 29.482 [7] in clause 6.1.12.6.2.2.

Upon receipt of the HTTP POST request from AIMLE client:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized for the request;
- b) if the AIMLE client:
  - 1) is not authorized for split operation subscription, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or
  - 2) is authorized to request ML split operation then the AIMLE server may create the subscription and store the subscription information. If the required AIMLE server:
    - i) has created the subscription, then in the response the AIMLE server shall include an indication of success, the subscription identity and may include an expiration time to maintain the subscription; or
    - ii) has not created the subscription, then in the response the AIMLE server shall include an indication of failure that the subscription is not created and shall include an appropriate error response as specified in 3GPP TS 29.482 [7] in clause 6.1.12.7.

If the AIMLE client determined the received HTTP POST request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP POST request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

### 5.5.2.3 Aimles\_SplitOpEvent\_Notify

#### 5.5.2.3.1 General

This service operation is used by AIMLE server to inform the AIMLE client about the split operation event.

#### 5.5.2.3.2 AIMLE operation for split operation notification

To indicate a split operation event to a subscriber, i.e. AIMLE client, the AIMLE server shall send an HTTP POST request to AIMLE client as specified in 3GPP TS 29.482 [7] in clause 6.1.12.5. The body of the POST message shall include the SplitOpEventNotif data structure as specified in 3GPP TS 29.482 [7] in clause 6.1.12.6.2.4.

Upon receipt of the HTTP POST request:

- a) the AIMLE client shall verify the identity of the AIMLE server and determine if the AIMLE server is authorized to notify the AIMLE client about the split operation event; and
- b) if the AIMLE server:
  - 1) is not authorized, the AIMLE client shall respond to the AIMLE server with an appropriate error status code; or
  - 2) is authorized, the AIMLE client shall respond to the AIMLE server with:
    - i) if the HTTP POST request is handled successfully, an HTTP "204 No Content" status code; and
    - ii) if the HTTP POST request is not handled successfully, an appropriate error response as specified in 3GPP TS 29.482 [7] in clause 6.1.12.7.

## 5.5.2.4 Aimles\_SplitOpEvent\_UpdateSubscription

### 5.5.2.4.1 General

This service operation is used by AIMLE client to update subscription with the AIMLE server for split operation event notification.

#### 5.5.2.4.2 AIMLE operation for split operation subscription update

To update subscription with the AIMLE server for split operation, the AIMLE client shall send an HTTP PATCH request (for partial update) to AIMLE server as specified in 3GPP TS 29.482 [7] in clause 6.1.12.3.3.3.3 or HTTP PUT request (for full replacement) to AIMLE server as specified in 3GPP TS 29.482 [7] in clause 6.1.12.3.3.3.2. The body of the PATCH message shall include the SplitOpEventSubPatch data structure as specified in 3GPP TS 29.482 [7] in clause 6.1.12.6.2.3 or the body of the PUT message shall include the SplitOpEventSub data structure as specified in 3GPP TS 29.482 [7] in clause 6.1.12.6.2.2.

Upon receipt of the HTTP PATCH request or HTTP PUT request from AIMLE client:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized for the request;
- b) if the AIMLE client:
  - 1) is not authorized for split operation subscription update, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or
  - 2) is authorized to request split operation then the AIMLE server may update the subscription information. If the AIMLE server:
    - i) has updated the subscription, then in the response the AIMLE server shall include an indication of success, and may include an expiration time; or
    - ii) has not updated the subscription, then in the response the AIMLE server shall include an indication of failure and may include an appropriate error response as specified in 3GPP TS 29.482 [7] in clause 6.1.12.7.

If the AIMLE server determined the received HTTP PATCH request or HTTP PUT request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP PATCH request or HTTP PUT request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.5.2.5 Aimles\_SplitOpEvent\_Unsubscribe

### 5.5.2.5.1 General

This service operation is used by AIMLE client to unsubscribe with the AIMLE server for ML split operation.

#### 5.5.2.5.2 AIMLE operation to unsubscribe for split operation

To unsubscribe with the AIMLE server for split operation, the AIMLE client shall send an HTTP DELETE request to AIMLE server as specified in 3GPP TS 29.482 [7] in clause 6.1.12.3.3.3.4.

Upon receipt of the HTTP DELETE request from AIMLE client:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized for the request;
- b) if the AIMLE client:
  - 1) is not authorized to unsubscribe for split operation, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or

- 2) is authorized to request split operation then the AIMLE server may cancel the subscription. If the AIMLE server:
- i) has cancelled the subscription, then in the response the AIMLE server shall include an indication of success; or
  - ii) has not cancelled the subscription, then in the response the AIMLE server shall include an indication of failure and may include an appropriate error response as specified in 3GPP TS 29.482 [7] in clause 6.1.12.7.

If the AIMLE server determined the received HTTP DELETE request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP DELETE request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.6 Split AI/ML operation pipeline service

### 5.6.1 Service description

The split AI/ML operation pipeline service enables an AIMLE client to obtain information about available instances of split operation pipeline or processing the nodes of interest.

### 5.6.2 Service operations

#### 5.6.2.1 Introduction

The service operation defined for Aimles\_SplitOpPipeline API is shown in the table 5.6.2.1-1.

**Table 5.6.2.1-1: Operations of split AI/ML operation pipeline service**

Service operation name	Description	Initiated by
Aimles_SplitOpPipeline_Discover	This service operation is used by the AIMLE client or VAL server to communicate with the AIMLE server for split AI/ML operation pipeline discovery.	AIMLE client
Aimles_SplitOpPipeline_Create	This service operation is used by the AIMLE client to create an instance of a split operation pipeline at the AIMLE server.	AIMLE client
Aimles_SplitOpPipeline_Update	This service operation is used by the AIMLE client to update an instance of a split operation pipeline at the AIMLE server.	AIMLE client
Aimles_SplitOpPipeline_Delete	This service operation is used by the AIMLE client to delete an instance of a split operation pipeline at the AIMLE server.	AIMLE client

#### 5.6.2.2 Aimles\_SplitOpPipeline\_Discover

##### 5.6.2.2.1 General

This service operation is used by AIMLE client to discover instance(s) of split AI/ML operation pipeline or processing nodes from the AIMLE server.

##### 5.6.2.2.2 AI/ML operation for pipeline discovery

To discover instance(s) of split AI/ML operation pipeline or processing nodes, the AIMLE client shall send an HTTP POST request to AIMLE server as specified in clause 6.5.4.2. The body of the POST message shall include the SplitOpPipelineDiscoverReq data structure as specified in clause 6.5.6.2.5.

Upon receipt of the HTTP POST request from the AIMLE client:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized for the request; and
- b) if the AIMLE client:
  - 1) is not authorized to request split operation pipeline discovery, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or
  - 2) is authorized to request split operation pipeline discovery;
    - i) the AIMLE server may determine existing instance(s) of a split operation pipeline satisfy the request parameters; and
    - ii) if no instance of a split operation pipeline satisfies the request parameters, the AIMLE server shall determine whether an instance of a split operation pipeline can be created and creates a split operation profile as defined in clause 5.6.2.3.

### 5.6.2.3 Aimles\_SplitOpPipeline\_Create

#### 5.6.2.3.1 General

This service operation is used by AIMLE client to create an instance of split AI/ML operation pipeline at the AIMLE server.

#### 5.6.2.3.2 AI/ML operation for pipeline creation

To create an instance of split AI/ML operation pipeline, the AIMLE client shall send an HTTP POST request to AIMLE server as specified in clause 6.5.3.2. The body of the POST message shall include the SplitOpPipelineCreateReq data structure as specified in clause 6.5.6.2.2.

Upon receipt of the HTTP POST request from the AIMLE client:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized for the request; and
- b) if the AIMLE client:
  - 1) is not authorized to request split operation pipeline creation, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or
  - 2) is authorized to request split operation pipeline creation then the AIMLE server shall determine if an instance of a split operation pipeline can be created or not. If the requested instance of split operation pipeline:
    - i) can be created, the AIMLE server shall create a split operation profile and in the response the AIMLE server shall include an indication that split operation pipeline was successful and the corresponding split operation profile; or
    - ii) cannot be created, the AIMLE server in the response shall include an indication that the split operation pipeline was unsuccessful with an appropriate error status code.

If the AIMLE client determined the received HTTP POST request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP POST request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

### 5.6.2.4 Aimles\_SplitOpPipeline\_Update

#### 5.6.2.4.1 General

This service operation is used by AIMLE client to update instance(s) of split AI/ML operation pipeline or processing nodes from the AIMLE server.

#### 5.6.2.4.2 AI/ML operation for pipeline update

To update instance(s) of split AI/ML operation pipeline or processing nodes, the AIMLE client shall send an HTTP PATCH request (for partial update) or HTTP PUT request (for full replacement) to AIMLE server as specified in clause 6.5.3.3.3. The body of the HTTP PATCH request message or HTTP PUT request message shall include the SplitOpPipelinePatch data structure as specified in clause 6.5.6.2.4 or HTTP PUT request message shall include the SplitOpPipelineCreateReq data structure as specified in clause 6.5.6.2.2.

Upon receipt of the HTTP PATCH request or HTTP PUT request from AIMLE client:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized for the request; and
- b) if the AIMLE client:
  - 1) is not authorized to request split operation pipeline update, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or
  - 2) is authorized to request split operation pipeline update;
    - i) has updated the instance, then in the response the AIMLE server shall include an indication of success, and may include an expiration time; or
    - ii) has not updated the instance, then in the response the AIMLE server shall include an indication of failure and may include an appropriate error response as specified in clause 6.5.7.

If the AIMLE server determined the received HTTP PATCH request or the received HTTP PUT request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP PATCH request or the HTTP PUT request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

#### 5.6.2.5 Aimles\_SplitOpPipeline\_Delete

##### 5.6.2.5.1 General

This service operation is used by AIMLE client to delete an instance of split AI/ML operation pipeline at the AIMLE server.

##### 5.6.2.5.2 AI/ML operation for pipeline deletion

To delete an instance of split AI/ML operation pipeline, the AIMLE client shall send an HTTP DELETE request to AIMLE server as specified in clause 6.5.3.3.3.

Upon receipt of the HTTP DELETE request from AIMLE client:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized for the request;
- b) if the AIMLE client:
  - 1) is not authorized to delete instance(s) of split AI/ML operation pipeline, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or
  - 2) is authorized to delete instance(s) of split AI/ML operation pipeline, the AIMLE server may delete the instance(s). If the AIMLE server:
    - i) has deleted an instance of split AI/ML operation pipeline, then in the response the AIMLE server shall include an indication of success; or
    - ii) has not deleted an instance of split AI/ML operation pipeline, then in the response the AIMLE server shall include an indication of failure and may include an appropriate error response as specified in clause 6.5.7.

If the AIMLE server determined the received HTTP DELETE request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP DELETE request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.7 FL group indication service

### 5.7.1 Service description

The FL group indication service enables the communication between the AIMLE server and the AIMLE client (i.e. the candidate FL member) for indicating the FL grouping procedure as defined in 3GPP TS 23.482 [4]. The FL group indication service is provided by the AIMLE client.

### 5.7.2 Service operations

#### 5.7.2.1 Introduction

The service operation defined for the Aimlec\_FLGroupIndication API is shown in the table 5.7.2.1-1.

**Table 5.7.2.1-1: Operations for FL group indication service**

Service operation name	Description	Initiated by
Aimlec_FLGroupIndication_Request	This service operation is used by AIMLE server to indicate AIMLE client (i.e. the candidate FL member) information about the FL members and the group.	AIMLE server

#### 5.7.2.2 Indicate\_FL\_Member\_Group

##### 5.7.2.2.1 General

The Aimlec\_FLGroupIndication\_Request service operation is used by AIMLE server to indicate to the AIMLE client the FL group information.

##### 5.7.2.2.2 Indicating FL group information

To update the AIMLE client (i.e. candidate FL member) about FL group, the AIMLE server shall send an HTTP POST request (custom operation: "Indicate FL group") with a Request-URI set to "{apiRoot}/aimlec-flgi/<apiVersion>/indicate" and with a body containing data type IndFIMember as defined in clause 6.6.6.2.2.

Upon receipt of the HTTP POST request:

- a) the AIMLE client shall verify the identity of the AIMLE server and determine if the AIMLE server is authorized to indicate the information on FL member groups; and
- b) if the AIMLE server:
  - 1) is not authorized, the AIMLE client shall respond to the AIMLE server with an appropriate error status code; or
  - 2) is authorized, the AIMLE client shall respond to the AIMLE server with:
    - i) if the HTTP POST request is handled successfully, an HTTP "204 No Content" status code; and
    - ii) if the HTTP POST request is not handled successfully, an appropriate error response as specified in clause 6.6.7.

## 5.8 Client data processing service

### 5.8.1 Service description

Client data processing service enables the communication between the AIMLE server and the AIMLE client for triggering the client data processing as defined in clause 8.15 in 3GPP TS 23.482 [4]. The client data processing is provided by the AIMLE client.

### 5.8.2 Service operations

#### 5.8.2.1 Introduction

The service operation defined for the `Aimlec_ClientDataProcessing` API is shown in the table 5.8.2.1-1.

**Table 5.8.2.1-1: Operations for `Aimlec_ClientDataProcessing` service**

Service operation name	Description	Initiated by
<code>Aimlec_ClientDataProcessing_Request</code>	This service operation is used by the AIMLE server to trigger the AIMLE client to request the client data processing.	AIMLE server

#### 5.8.2.2 `Aimlec_ClientDataProcessing_Request`

##### 5.8.2.2.1 General

The `Aimlec_ClientDataProcessing_Request` service operation is used by AIMLE server to trigger the AIMLE client to request the client data processing procedure which includes the data preparation or the data analysis.

##### 5.8.2.2.2 Triggering client data processing procedure

To trigger the AIMLE client to request the client data processing, the AIMLE server shall send an HTTP POST request (custom operation: "Trigger client data processing") with a Request-URI set to "{apiRoot}/aimlec-data-proc/<apiVersion>/trigger" and with a body containing `ClcDataProcReq` structure data type as specified in clause 6.7.6.2.2.

Upon receipt of the HTTP POST request:

- a) the AIMLE client shall verify the identity of the AIMLE server and determine if the AIMLE server is authorized to request the AIMLE client for the request; and
- b) if the AIMLE server:
  - 1) is not authorized, the AIMLE client shall respond to the AIMLE server with an appropriate error status code; or
  - 2) is authorized, the AIMLE client shall respond to the AIMLE server with:
    - i) if the HTTP POST request is handled successfully, an HTTP "200 OK" status code with the response body including the `ClcDataProcResp` data structure as specified in clause 6.7.6.2.3; or
    - ii) if the HTTP POST request is not handled successfully, an appropriate error response as specified in clause 6.7.7.

The AIMLE client may respond to the AIMLE server with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the request shall be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.9 ML model training capability evaluation service

### 5.9.1 Service description

The ML model training capability evaluation service enables the AIMLE server to request the AIMLE client to perform ML model training capability evaluation to support FL training (e.g. HFL, VFL) as defined in 3GPP TS 23.482 [4]. The AIMLE client service operations service is provided by the AIMLE client.

### 5.9.2 Service operations

#### 5.9.2.1 Introduction

The service operations defined for the Aimlec\_MLModTngCapEva API are shown in the table 5.9.2.1-1.

**Table 5.9.2.1-1: Operations for ML model training capability evaluation service**

Service operation name	Description	Initiated by
Aimlec_MLModTngCapEva_Request	This service operation is used by AIMLE server to requests for the ML model training capability evaluation.	AIMLE server

#### 5.9.2.2 Aimlec\_MLModTngCapEva\_Request

##### 5.9.2.2.1 General

The Aimlec\_MLModTngCapEva\_Request service operation is used by the AIMLE server to request the AIMLE client to perform the ML model training capability evaluation.

##### 5.9.2.2.2 Perform ML model training capability evaluation

To request the AIMLE client to perform the ML model training capability evaluation, the AIMLE server shall send an HTTP POST request (custom operation: "ML model training capability evaluation request") to the AIMLE client, with the request URI set to "{apiRoot}/aimlec-ml-mtce/<apiVersion>/request", as specified in clause 6.8.4.2 and include in a body of the HTTP POST request a MIModTngCapEvalReq data structure defined in clause 6.8.6.2.2.

Upon reception of the HTTP POST request, the AIMLE client:

- 1) if the "availTime" attribute is received, shall evaluate availability for the requested time to support FL operation;
- 2) if the "testTask" attribute is received, shall run the task for test ML model training capability;
- 3) if "modelInfo" attribute is received, shall evaluate own capability for the indicated AI/ML model information and model parameters for use in the FL training process;
- 4) if the "dataSetReq" attribute is received, shall determine a data alignment between the datasets of the different domains;
- 5) based on the performed actions in steps 1 – 4, shall evaluate own capability and availability to join the FL training process; and
- 6) shall respond to the AIMLE server with an HTTP "200 OK" status code and include in the response body a MIModTngCapEvalResp data structure which:
  - a) shall contain the outcome of the ML model training capability evaluation in the "capEvalOut" attribute; and
  - b) if the "capEvalOut" attribute indicates:
    - i) the ability to join the FL training process, shall contain the test result of the ML model training capability evaluation in the "testResult" attribute (e.g. successfully completed test task, available for the requested time to support FL operation, requirement on dataset successfully executed); or

- ii) the inability to join the FL training process, shall contain the "evalFailInd" attribute which specifies the reason for not joining the FL training process (e.g. test task not completed, unavailable for the requested time to support FL operation, requirement on dataset cannot be executed, indicated model parameter for use in the FL training process not supported).

On failure, the AIMLE client shall take proper error handling actions, as specified in clause 6.8.7, and respond with an appropriate error status code.

If the AIMLE client determined the received HTTP POST request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP POST request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

The ML model training capability result can be used by the AIMLE server to select FL members for FL training process (e.g. HFL, VFL).

## 5.10 TL enablement service

### 5.10.1 Service description

The Transfer Learning (TL) enablement service enables the communication between the AIMLE client (i.e. the VAL UE) and the AIMLE server for TL enablement service as defined in 3GPP TS 23.482 [4]. The TL enablement service is provided by the AIMLE server.

### 5.10.2 Service operations

#### 5.10.2.1 Introduction

The service operation defined for the Aimles\_UeTLModelSelectionAssistance API is shown in the table 5.10.2.1-1.

**Table 5.10.2.1-1: Operations for TL enablement service**

Service operation name	Description	Initiated by
Aimles_UeTLModelSelectionAssistance_Request	This service operation is used by AIMLE client to perform ML model selection by using a pre-trained model.	AIMLE client

#### 5.10.2.2 Aimles\_UeTLModelSelectionAssistance\_Request

##### 5.10.2.2.1 General

The Aimles\_UeTLModelSelectionAssistance\_Request service operation is used by AIMLE client for the TL enablement service to perform ML model selection for the target ML task by evaluating one or more pre-trained models, provided by the AIMLE server. Upon completion of the evaluation, the AIMLE client shall retrieve the selected ML model as described in 3GPP TS 29.482 [7].

##### 5.10.2.2.2 AI/ML operation for TL model selection assistance request

To request the AIMLE server to provide one or more pre-trained ML models for the TL enablement service, the AIMLE client shall send an HTTP POST request (custom operation: "TL model selection assistance") with a Request-URI set to "{apiRoot}/aimles-ue-tl-msa/<apiVersion>/assist-tlms" and with a body containing data type TModelSelectAssistReq as defined in clause 6.10.6.2.2.

Upon receipt of the HTTP POST request:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized to request one or more pre-trained ML models for the TL enablement service; and

b) if the AIMLE client:

- 1) is not authorized, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or
- 2) is authorized, the AIMLE sever:
  - i) shall request ML repository one or more pre-trained ML models for the TL enablement service as described in 3GPP TS 29.482 [7]; and
  - ii) shall respond to the AIMLE server with:
    - A) if the HTTP POST request is handled successfully, an HTTP "200 OK" response code with the response body containing data type TIModelSelectAssistResp as defined in clause 6.9.6.2.3 which includes one or more pre-trained ML models for the TL enablement service; and
    - B) if the HTTP POST request is not handled successfully, an appropriate error response as specified in clause 6.9.7.

The AIMLE client may respond to the AIMLE server with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the request shall be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.11 AIMLE client service operations service

### 5.11.1 Service description

The AIMLE client service operations service enables the communication between the AIMLE client (e.g. AI/ML capable UE) and the AIMLE server for AIMLE client service operations as defined in 3GPP TS 23.482 [4]. The AIMLE client service operations service is provided by the AIMLE client.

### 5.11.2 Service operations

#### 5.11.2.1 Introduction

The service operations defined for the Aimlec\_AIMLEClientServiceOperations API are shown in the table 5.11.2.1-1.

**Table 5.11.2.1-1: Operations for AIMLE client service operations service**

Service operation name	Description	Initiated by
Aimlec_AIMLEClientServiceOperations_Request	This service operation is used by AIMLE server to request the AIMLE client service operation.	AIMLE server

#### 5.11.2.2 Aimlec\_AIMLEClientServiceOperations\_Request

##### 5.11.2.2.1 General

The Aimlec\_AIMLEClientServiceOperations\_Request service operation is used by AIMLE server to request the AIMLE client to perform the AIMLE client service operation.

##### 5.11.2.2.2 Perform AIMLE client service operation

To request the AIMLE client to perform the AIMLE client service operation, the AIMLE server shall send an HTTP POST request (custom operation: "AIMLE service operation request") to the AIMLE client, with the request URI set to "{apiRoot}/aimlec-serv-ops/<apiVersion>/perform" and the request body including the AimleClientServOpReq data structure, as specified in clause 6.10.4.2.

Upon reception of the HTTP POST request, the AIMLE client:

- 1) shall perform the service operation mode received in the "servOpMode" attribute for the requested AI/ML service operation received in the "servOpId" attribute;
- 2) if the "servOpModeCfg" attribute is received, shall configure and monitor the AI/ML service operation in accordance with the received AI/ML service operation mode configuration requirements;
- 3) if the "servOpModeStatRptg" attribute is received, shall determine whether a periodic or event-based reporting of the AI/ML service operation mode status shall be applied towards the AIMLE server; and
- 4) shall respond to the AIMLE server with an HTTP "200 OK" status code and indicate the current service operation mode status within the "servOpModeStatus" attribute contained in the response body AimleClientServOpResp data structure.

On failure, the AIMLE client shall take proper error handling actions, as specified in clause 6.10.7, and respond with an appropriate error status code.

If the AIMLE client determined the received HTTP POST request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP POST request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.12 AIMLE client AI/ML task transfer service

### 5.12.1 Service description

The AIMLE client AI/ML task transfer service enables the communication between the AIMLE client (e.g. AI/ML capable UE) and the AIMLE server for AI/ML task transfer operations as defined in 3GPP TS 23.482 [4]. The AIMLE client AI/ML task transfer service is provided by the AIMLE client.

### 5.12.2 Service operations

#### 5.12.2.1 Introduction

The service operations defined for Aimlec\_AimlTaskTransfer API are shown in the table 5.12.2.1-1.

**Table 5.12.2.1-1: Operations for AIMLE client AI/ML task transfer service**

Service operation name	Description	Initiated by
Aimlec_AIMLTaskTransfer_Request	This service operation is used by the AIMLE server to request AI/ML task transfer.	AIMLE server
Aimlec_DirectAIMLTaskTransfer_Request	This service operation is used by the source AIMLE client to request direct AI/ML task transfer.	AIMLE client

#### 5.12.2.2 Aimlec\_AIMLTaskTransfer\_Request

##### 5.12.2.2.1 General

The Aimlec\_AIMLTaskTransfer\_Request service operation is used by the AIMLE server to request the AIMLE client to perform the AI/ML task transfer operation.

##### 5.12.2.2.2 Requesting AI/ML task transfer

To request the AIMLE client to perform the AI/ML task transfer operation, the AIMLE server shall send an HTTP POST request (custom operation: "AI/ML task transfer") to the AIMLE client, with the request URI set to "{apiRoot}/aimlec-task-transfer/<apiVersion>/request" and the request body including the AimleClientTaskTransferReq data structure, as specified in clause 6.11.6.2.2, which:

- 1) shall contain an identity of the AIMLE client from which the AI/ML task is to be transferred within the "sourceAimlId" attribute;
- 2) shall contain type of the AI/ML operation to be transferred within the "aimlTaskType" attribute;
- 3) shall contain type of the AI/ML information in the AI/ML task to be transferred within the "aimlInfoType" attribute; and
- 4) may contain the requested time for the AI/ML task transfer within the "aimlTaskTransferTime" attribute.

Upon reception of the HTTP POST request, the AIMLE client shall verify the identity of the AIMLE server and determine if the AIMLE server is authorized to request AI/ML task transfer. If the AIMLE server:

- 1) is not authorized or a failure occurs during HTTP request processing, the AIMLE client shall take proper error handling actions, as specified in clause 6.11.7, and respond with an appropriate error status code; or
- 2) is authorized, the AIMLE client shall respond to the AIMLE server with:
  - a) an HTTP "200 OK" status code and indicate the time for the AI/ML task transfer within the "aimlTaskTransferTime" attribute contained in the response body `AimleClientTaskTransferRes`; or
  - b) an HTTP "204 No Content" status code if the AIMLE client does not provide the AI/ML task transfer information in the response.

If the AIMLE client determined the received HTTP POST request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP POST request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

### 5.12.2.3 Aimlec\_DirectAIMLTaskTransfer\_Request

#### 5.12.2.3.1 General

The `Aimlec_DirectAIMLTaskTransfer_Request` service operation is used by the source AIMLE client to request the AIMLE client to perform the direct AI/ML task transfer operation.

#### 5.12.2.3.2 Requesting direct AI/ML task transfer

To request the AIMLE client to perform the AI/ML task transfer operation, the source AIMLE client shall send an HTTP POST request (custom operation: "Direct AI/ML task transfer") to the AIMLE client, with the request URI set to "{apiRoot}/aimlec-task-transfer/<apiVersion>/request-direct" and the request body including the `AimleClientDirectTransferReq` data structure, as specified in clause 6.11.6.2.4, which:

- 1) shall contain type of the AI/ML operation to be transferred within the "aimlTaskType" attribute;
- 2) shall contain type of the AI/ML information in the AI/ML task to be transferred within the "aimlInfoType" attribute; and
- 3) may contain the requested time for the AI/ML task transfer within the "aimlTaskTransferTime" attribute.

Upon receipt of the HTTP POST request, the AIMLE client shall perform an authentication and authorization check to determine whether the source AIMLE client is permitted to request the AI/ML task transfer operation. If the source AIMLE client:

- 1) is not authorized or a failure occurs during HTTP request processing, the AIMLE client shall take proper error handling actions, as specified in clause 6.11.7, and respond with an appropriate error status code; or
- 2) is authorized, the AIMLE client shall respond with an HTTP "204 No Content" status code.

If the AIMLE client determined the received HTTP POST request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE

client towards which the HTTP POST request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.13 AIMLE server AI/ML task transfer service

### 5.13.1 Service description

The AIMLE server AI/ML task transfer service enables the communication between the AIMLE client (e.g. AI/ML capable UE) and the AIMLE server for the AI/ML task transfer operations as defined in 3GPP TS 23.482 [4]. The AIMLE server AI/ML task transfer service is provided by the AIMLE server.

### 5.13.2 Service operations

#### 5.13.2.1 Introduction

The service operations defined for the `Aimles_AimlTaskTransfer` API are shown in the table 5.13.2.1-1.

**Table 5.13.2.1-1: Operations for AIMLE server AI/ML task transfer service**

Service operation name	Description	Initiated by
<code>Aimles_AIMLTaskTransferAssist_Request</code>	This service operation is used by the AIMLE client to request the AIMLE server to assist in an AI/ML task transfer.	AIMLE client
<code>Aimles_AIMLESControlledAIMLTaskTransfer_Request</code>	This service operation is used by the AIMLE client to request the AIMLE server to perform the AIMLE server controlled AI/ML task transfer.	AIMLE client

#### 5.13.2.2 `Aimles_AIMLTaskTransferAssist_Request`

##### 5.13.2.2.1 General

The `Aimles_AIMLTaskTransferAssist_Request` service operation is used by the AIMLE client to request the AIMLE server to assist in AI/ML task transfer operation.

##### 5.13.2.2.2 Requesting AI/ML task transfer assist

To get assistance from the AIMLE server, the AIMLE client shall send an HTTP POST request (custom operation: "AI/ML task transfer assist") to the AIMLE server, with the request URI set to "`{apiRoot}/aimles-task-transfer/<apiVersion>/assist-tt`" and the request body including the `AimlesTaskTransferAssistReq` data structure as specified in clause 6.12.6.2.2.

Upon reception of the HTTP POST request, the AIMLE server, based on the content of the received `AimlesTaskTransferAssistReq` data structure, shall discover other AIMLE clients, select one or more target AIMLE clients and determine which the transfer mode shall be applied. The AIMLE server shall send a "200 OK" response to the HTTP POST request. The AIMLE server shall include in the response body the `AimlesTaskTransferAssistResp` data structure, as specified in clause 6.12.6.2.3, which:

- shall contain a time window for assistance in the AI/ML task transfer in the "assistanceTime" attribute;
- shall contain the list of selected AIMLE clients in the "targetAimlIds" attribute; and
- may contain the transfer mode to be applied in the "transferMode" attribute.

On failure, the AIMLE server shall take proper error handling actions, as specified in clause 6.12.7, and respond with an appropriate error status code.

If the AIMLE server determined the received HTTP DELETE request needs to be redirected, the AIMLE server may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE

server towards which the HTTP DELETE request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

### 5.13.2.3 Aimles\_AIMLESConrolledAIMLTaskTransfer\_Request

#### 5.13.2.3.1 General

The Aimles\_AIMLESConrolledAIMLTaskTransfer\_Request service operation is used by the AIMLE client to communicate with the AIMLE server to request AIMLE server-controlled AI/ML task transfer from the AIMLE client.

#### 5.13.2.3.2 Requesting AIMLE server controlled AI/ML task transfer

To request the AIMLE server to perform the AIMLE server controlled AI/ML task transfer, the AIMLE client shall send an HTTP POST request (custom operation: "Controlled AI/ML task transfer") to the AIMLE server, with the request URI set to "{apiRoot}/aimles-task-transfer/<apiVersion>/request-ctld " and the request body including the AimlesControlledTaskTransferReq data structure as specified in clause 6.12.6.2.4.

Upon receipt of the HTTP POST request, the AIMLE server shall perform an authentication and authorization check to determine whether the AIMLE client is permitted to communicate with the AIMLE server. If the AIMLE client:

- 1) is authorized to communicate with the AIMLE server, the AIMLE server shall check the availability of the target AIMLE client. If the target AIMLE client is available, the AIMLE server shall send a "200 OK" response to the HTTP POST request. The AIMLE server shall include in the response body the AimlesControlledTaskTransferResp data structure, as specified in clause 6.12.6.2.5, which shall contain a time window for assistance in the AI/ML task transfer in the "assistanceTime" attribute; or
- 2) is not authorized or the target AIMLE client is not available, the AIMLE server shall take proper error handling actions, as specified in clause 6.12.7, and respond with an appropriate error status code.

If the AIMLE server determined the received HTTP DELETE request needs to be redirected, the AIMLE server may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE server towards which the HTTP DELETE request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.14 ML model retrieval service

### 5.14.1 Service description

The ML model retrieval service enables an AIMLE client to subscribe, unsubscribe, update the subscription to the event for the ML model retrieval.

### 5.14.2 Service operations

#### 5.14.2.1 Introduction

The service operation defined for Aimles\_MLModelRetrieval API is shown in the table 5.13.2.1-1.

**Table 5.14.2.1-1: Operations of ML model retrieval service**

Service operation name	Description	Initiated by
Aimles_MLModelRetrieval_Request	This service operation is used by the AIMLE client to request for one-time ML model retrieval.	AIMLE client
Aimles_MLModelRetrieval_Subscribe	This service operation is used by the AIMLE client to request to subscribe to for ML model retrieval.	AIMLE client
Aimles_MLModelRetrieval_Notify	This service operation is used by the AIMLE server to notify a previously subscribed AIMLE client with ML model retrieval.	AIMLE server
Aimles_MLModelRetrieval_UpdateSubscription	This service operation is used by the AIMLE client to update an existing subscription for ML model retrieval.	AIMLE client
Aimles_MLModelRetrieval_Unsubscribe	This service operation is used by the AIMLE client to cancel or delete an existing subscription for ML model retrieval.	AIMLE client

## 5.14.2.2 Aimles\_MLModelRetrieval\_Request

### 5.14.2.2.1 General

This service operation is used by AIMLE client to request for one-time ML model retrieval from the AIMLE server.

### 5.14.2.2.2 AIMLE operation for model retrieval

To request one-time ML model retrieval, the AIMLE client shall send an HTTP POST request to AIMLE server as specified in 3GPP TS 29.482 [7] in clause 6.1.13.4. The body of the POST message shall include the MLMdlRetReq data structure as specified in 3GPP TS 29.482 [7] in clause 6.1.13.6.2.5.

Upon receipt of the HTTP POST request from AIMLE client:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized for the request;
- b) if the AIMLE client:
  - 1) is not authorized to request ML model retrieval, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or
  - 2) is authorized to request ML model retrieval then the AIMLE server shall determine if the required ML models are available or not. For the registered AIMLE clients the AIMLE server uses the registered information and for the AIMLE clients that are not registered, the AIMLE server uses the ML model retrieval filters. If the required ML models are:
    - i) available, then in the response the AIMLE server includes an indication that the retrieval was successful and includes the ML models; and
    - ii) not available, then in the response the AIMLE server includes an indication that the retrieval failed and includes appropriate error code. The AIMLE server may also perform the ML model information discovery procedure with the ML using clause 6.1.13.7 of 3GPP TS 29.482 [7].

## 5.14.2.3 Aimles\_MLModelRetrieval\_Subscribe

### 5.14.2.3.1 General

This service operation is used by AIMLE client to subscribe to notifications from the AIMLE server about ML models retrieval.

### 5.14.2.3.2 AIMLE operation for model retrieval subscription

To subscribe with the AIMLE server to be notified of ML model retrieval, the AIMLE client shall send an HTTP POST request to AIMLE server as specified in 3GPP TS 29.482 [7] in clause 6.1.13.3.2. The body of the POST message shall include the MLMdlRetSub data structure as specified in 3GPP TS 29.482 [7] in clause 6.1.13.6.2.2.

Upon receipt of the HTTP POST request from AIMLE client:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized for the request;
- b) if the AIMLE client:
  - 1) is not authorized for ML model retrieval subscription, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or
  - 2) is authorized to request ML model retrieval then the AIMLE server may create the subscription and store the subscription information. If the required AIMLE server:
    - i) has created the subscription, then in the response the AIMLE server shall include an HTTP "201 Created" status code with the response body including an indication of success, the subscription identity and may include an expiration time to maintain the subscription; or
    - ii) has not created the subscription, then in the response the AIMLE server shall include an indication of failure that the subscription is not created and shall include an appropriate error response as specified in clause 6.1.13.7 of 3GPP TS 29.482 [7].

If the AIMLE server determined the received HTTP POST request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP POST request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

#### 5.14.2.4 Aimles\_MLModelRetrieval\_Notify

##### 5.14.2.4.1 General

This service operation is used by AIMLE server to inform the AIMLE client about the availability of ML model.

##### 5.14.2.4.2 AIMLE operation for model retrieval notification

To indicate availability of ML models to a subscriber, i.e. AIMLE client, the AIMLE server shall send an HTTP POST request to AIMLE client as specified in 3GPP TS 29.482 [7] in clause 6.1.13.5.2. The body of the POST message shall include the MLMdlRetNotif data structure as specified in 3GPP TS 29.482 [7] in clause 6.1.13.6.2.4.

Upon receipt of the HTTP POST request:

- a) the AIMLE client shall verify the identity of the AIMLE server and determine if the AIMLE server is authorized to indicate the newly available ML models; and
- b) if the AIMLE server:
  - 1) is not authorized, the AIMLE client shall respond to the AIMLE server with an appropriate error status code; or
  - 2) is authorized, the AIMLE client shall respond to the AIMLE server with:
    - i) if the HTTP POST request is handled successfully, an HTTP "204 No Content" status code; and
    - ii) if the HTTP POST request is not handled successfully, an appropriate error response as specified in clause 6.1.13.7 of 3GPP TS 29.482 [7].

#### 5.14.2.5 Aimles\_MLModelRetrieval\_UpdateSubscription

##### 5.14.2.5.1 General

This service operation is used by AIMLE client to update subscription with the AIMLE server for ML model retrieval.

#### 5.14.2.5.2 AIMLE operation for model retrieval subscription update

To update subscription with the AIMLE server for ML model retrieval, the AIMLE client shall send to the AIMLE server an HTTP PATCH request (for partial update) as specified in 3GPP TS 29.482 [7] in clause 6.1.13.3.3.3.3 or HTTP PUT request (for full replacement) as specified in 3GPP TS 29.482 [7] in clause 6.1.13.3.3.3.3. The body of the HTTP PATCH request message shall include the MLMdlRetSubPatch data structure as specified in 3GPP TS 29.482 [7] clause 6.1.13.6.2.3 or the HTTP PUT request message shall include the MLMdlRetSub data structure as specified in 3GPP TS 29.482 [7] in clause 6.1.13.6.2.2.

Upon receipt of the HTTP PATCH request or the HTTP PUT request from AIMLE client:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized for the request;
- b) if the AIMLE client:
  - 1) is not authorized for ML model retrieval subscription update, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or
  - 2) is authorized to request ML model retrieval then the AIMLE server may update the subscription information. If the AIMLE server:
    - i) has updated the subscription, then in the response the AIMLE server shall include an indication of success, and may include an expiration time;
    - ii) response may include either:
      - the HTTP "204 No Content" status code; or
      - the HTTP "200 OK" status code with the response body including a representation of the updated resource within the MLMdlRetSub data structure as specified in 3GPP TS 29.482 [7] in clause 6.1.13.6.2.2; or
    - iii) has not updated the subscription, then in the response the AIMLE server shall include an indication of failure and may include an appropriate error response as specified in clause 6.1.13.7 of 3GPP TS 29.482 [7].

If the AIMLE server determined the received HTTP PATCH request or the received HTTP PUT request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP PATCH request or the HTTP PUT request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

#### 5.14.2.6 Aimles\_MLModelRetrieval\_Unsubscribe

##### 5.14.2.6.1 General

This service operation is used by AIMLE client to unsubscribe with the AIMLE server for ML model retrieval.

##### 5.14.2.6.2 AIMLE operation to unsubscribe for model retrieval

To unsubscribe with the AIMLE server for ML model retrieval, the AIMLE client shall send an HTTP DELETE request to AIMLE server as specified in 3GPP TS 29.482 [7] in clause 6.1.13.3.3.4.

Upon receipt of the HTTP DELETE request from AIMLE client:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized for the request;
- b) if the AIMLE client:
  - 1) is not authorized to unsubscribe for ML model retrieval, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or

- 2) is authorized to request ML model retrieval then the AIMLE server may cancel the subscription. If the AIMLE server:
- i) has cancelled the subscription, then in the response the AIMLE server shall include an indication of success; or
  - ii) has not cancelled the subscription, then in the response the AIMLE server shall include an indication of failure and may include an appropriate error response as specified in clause 6.1.13.7 of 3GPP TS 29.482 [7].

If the AIMLE client determined the received HTTP DELETE request needs to be redirected, the AIMLE client may respond with an HTTP "307 Temporary Redirect" status code or an HTTP "308 Permanent Redirect" status code including an HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the HTTP DELETE request should be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

## 5.15 ML model update service

### 5.15.1 Service description

The ML Model update service operations service enables AIMLE client to request ML model update at the AIMLE server as defined in 3GPP TS 23.482 [4].

### 5.15.2 Service operations

#### 5.15.2.1 Introduction

The service operations defined for the Aimles\_MLModelUpdate API are shown in the table 5.15.2.1-1.

**Table 5.15.2.1-1: Operations for ML Model Update service**

Service operation name	Description	Initiated by
Aimles_MLModelUpdate_Request	This service operation is used by AIMLE client to request the ML model update from the AIMLE server.	AIMLE client

#### 5.15.2.2 Aimles\_MLModelUpdate\_Request

##### 5.15.2.2.1 General

The Aimles\_MLModelUpdate\_Request service operation is used by AIMLE client to request the ML model update from the AIMLE server.

##### 5.15.2.2.2 ML model update service request

To request the AIMLE server to provide ML model updates, the AIMLE client shall send an HTTP POST request with a body containing data type MLModelUpdateReq as defined in 3GPP TS 29.482 [7] in clause 6.1.15.6.2.2.

Upon receipt of the HTTP POST request:

- a) the AIMLE server shall verify the identity of the AIMLE client and determine if the AIMLE client is authorized to request ML model update service; and
- b) if the AIMLE client:
  - 1) is not authorized, the AIMLE server shall respond to the AIMLE client with an appropriate error status code; or
  - 2) is authorized, the AIMLE server:

- i) shall request ML repository for one or more pre-trained ML models that can be used for ML model update service as described in 3GPP TS 29.482 [7]; and
- ii) shall respond to the AIMLE client with:
  - A) if the HTTP POST request is handled successfully, the HTTP "200 OK" response code with the response body containing data type MLMdlUpdateRsp as defined in 3GPP TS 29.482 [7] in clause 6.1.15.6.2.3 which includes ML model update response; and
  - B) if the HTTP POST request is not handled successfully, an appropriate error response as specified in 3GPP TS 29.482 [7] in clause 6.1.15.7.

The AIMLE server may respond to the AIMLE client with the HTTP "307 Temporary Redirect" status code or the HTTP "308 Permanent Redirect" status code including the HTTP "Location" header containing an alternative URI representing the end point of an alternative AIMLE client towards which the request shall be sent. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

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## 6 API definitions

### 6.1 Aimlec\_AIMLEClientParticipation API

#### 6.1.1 Introduction

The AIMLE client participation service shall use the Aimlec\_AIMLEClientParticipation API.

The API URI of the Aimlec\_AIMLEClientParticipation API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>**

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [5].
- The <apiName> shall be "aimlec-cp".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 6.1.3.

#### 6.1.2 Usage of HTTP and common API related aspects

The provisions of clause 5.2 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_AIMLEClientParticipation API.

#### 6.1.3 Resources

There are neither resources nor methods used for the service.

#### 6.1.4 Custom operations without associated resources

##### 6.1.4.1 Overview

Table 6.1.4.1-1 provides an overview of the custom operations and applicable HTTP methods defined for the Aimlec\_AIMLEClientParticipation API.

**Table 6.1.4.1-1: Custom operations without associated resources**

Operation name	Custom operation URI	Mapped HTTP method	Description
Participation for AI/ML operations	/participation	POST	Used by the AIMLE server to request the AIMLE client for participation of the AI/ML operations.

## 6.1.4.2 Operation: Participation for AI/ML operations

### 6.1.4.2.1 Description

The custom operation enables the AIMLE server to request the AIMLE client to join or depart one or more AI/ML operations.

### 6.1.4.2.2 Operation definition

This operation shall support the response data structures and response codes specified in tables 6.1.4.2.2-1, 6.1.4.2.2-2, 6.1.4.2.2-3 and 6.1.4.2.2-4.

**Table 6.1.4.2.2-1: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
AimlecParticipationReq	M	1	Request for participation the AI/ML operations.

**Table 6.1.4.2.2-2: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
AimlecParticipationResp	M	1	200 OK	Successful case. The requested "participation the AI/ML operation" shall be responded.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status code for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.1.4.2.2-3: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

**Table 6.1.4.2.2-4: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

## 6.1.5 Notifications

### 6.1.5.1 General

There are no notifications defined for the Aimlec\_AIMLEClientParticipation API in this release of the specification.

## 6.1.6 Data model

### 6.1.6.1 General

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

Table 6.1.6.1-1 specifies the data types defined for the Aimlec\_AIMLEClientParticipation API.

**Table 6.1.6.1-1: Aimlec\_AIMLEClientParticipation API specific data types**

Data type	Clause defined	Description	Applicability
AimlecParticipationReq	6.1.6.2.2	Represents the participation request for the AI/ML operations.	
AimlecParticipationResp	6.1.6.2.3	Represents the participation response for the AI/ML operations.	
ClienSetPart	6.1.6.3.3	Represents the participation request for the AIMLE client set.	
SchedAimlOperation	6.1.6.2.4	Represents the scheduled AI/ML participation type.	

Table 6.1.6.1-2 specifies data types re-used by the Aimlec\_AIMLEClientParticipation API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the Aimlec\_AIMLEClientParticipation API.

**Table 6.1.6.1-2: Aimlec\_AIMLEClientParticipation API re-used data types**

Data type	Reference	Comments	Applicability
AimlOperation	6.3.6.3.5	Represents the type of the AI/ML operation.	
DatasetRequirement	3GPP TS 29.482 [7]	Represents the dataset requirements.	
ScheduledCommunicationTime	3GPP TS 29.122 [5]	Represents an offered scheduled communication time.	
ServiceRequirement	3GPP TS 29.482 [7]	Represents the service requirements.	

### 6.1.6.2 Structured data types

#### 6.1.6.2.1 Introduction

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

## 6.1.6.2.2 Type: AimlecParticipationReq

**Table 6.1.6.2.2-1: Definition of type AimlecParticipationReq**

Attribute name	Data type	P	Cardinality	Description	Applicability
requesterId	string	M	1	Contains the identifier of the service consumer. For the AIMLE client, e.g. unique client identifier. For the AIMLE server, e.g. FQDN, URI.	
clientSetId	string	M	1	Identifies the identity of the AIMLE client set.	
clientSetPart	ClientSetPart	M	1	Identifies the participation request for the AIMLE client set.	
mlModelId	string	M	1	Identifies the identity of the ML model for AI/ML operation.	
schedAimlOperations	array(SchedAimlOperation)	M	1..N	Identifies the list of AI/ML operations which are required to be performed.	
dataSetReq	DatasetRequirement	M	1	Identifies the dataset requirements.	
serviceReq	ServiceRequirement	M	1	Identifies the service requirements.	

## 6.1.6.2.3 Type: AimlecParticipationResp

**Table 6.1.6.2.3-1: Definition of type AimlecParticipationResp**

Attribute name	Data type	P	Cardinality	Description	Applicability
clientStatus	boolean	M	1	A "true" value indicates the willingness of the AIMLE client to be added to or to be removed from the AIMLE client list to perform AI/ML operations.  A "false" value indicates the denial of the AIMLE client to be added to or to be removed from the AIMLE client list to perform AI/ML operations.	

## 6.1.6.2.4 Type: SchedAimlOperation

**Table 6.1.6.2.4-1: Definition of type SchedAimlOperation**

Attribute name	Data type	P	Cardinality	Description	Applicability
aimlOperation	AimlOperation	M	1	Identifies the type of the AI/ML operation.	
aimlOperSched	ScheduledCommunicationTime	O	0..1	Identifies the schedule for the AI/ML operation.	

## 6.1.6.3 Simple data types and enumerations

## 6.1.6.3.1 Introduction

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

## 6.1.6.3.2 Simple data types

The simple data types defined in table 6.1.6.3.2-1 shall be supported.

**Table 6.1.6.3.2-1: Simple data types**

Type Name	Type Definition	Description	Applicability

### 6.1.6.3.3 Enumeration: ClientSetPart

The enumeration ClientSetPart represents the participation request for the AIMLE client set. It shall comply with the provisions defined in table 6.1.6.3.3-1.

**Table 6.1.6.3.3-1: Enumeration ClieSetPart**

Enumeration value	Description	Applicability
JOIN	Identifies to join the AIMLE client set.	
DEPART	Identifies to depart the AIMLE client set.	

### 6.1.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

### 6.1.6.5 Binary data

#### 6.1.6.5.1 Binary data types

**Table 6.1.6.5.1-1: Binary data types**

Name	Clause defined	Content type

## 6.1.7 Error handling

### 6.1.7.1 General

For the Aimlec\_AIMLEClientParticipation API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [5]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [5] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [5].

In addition, the requirements in the following clauses are applicable for the Aimlec\_AIMLEClientParticipation API.

### 6.1.7.2 Protocol errors

No specific procedures for the Aimlec\_AIMLEClientParticipation API are specified.

### 6.1.7.3 Application errors

The application errors defined for the Aimlec\_AIMLEClientParticipation API are listed in table 6.1.7.3-1.

**Table 6.1.7.3-1: Application errors**

Application Error	HTTP status code	Description

## 6.1.8 Feature negotiation

The optional features in table 6.1.8-1 are defined for the Aimlec\_AIMLEClientParticipation API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [5].

**Table 6.1.8-1: Supported features**

Feature number	Feature Name	Description

## 6.1.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_AIMLEClientParticipation API.

## 6.2 Aimlec\_HFLTraining API

### 6.2.1 Introduction

The Horizontal Federated Learning (HFL) training service shall use the Aimlec\_HFLTraining API.

The API URI of the Aimlec\_HFLTraining API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>**

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [5].
- The <apiName> shall be "aimlec-hfl-trng".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 6.2.3.

### 6.2.2 Usage of HTTP and common API related aspects

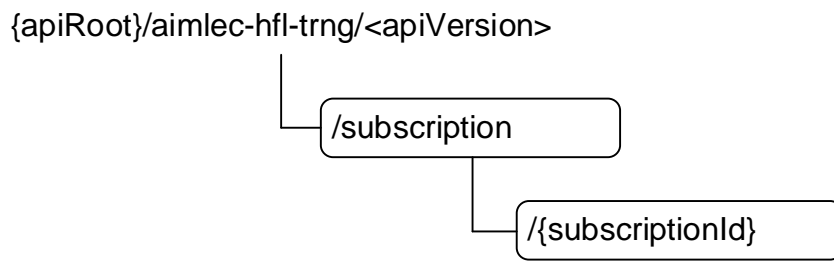
The provisions of clause 5.2 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_HFLTraining API.

### 6.2.3 Resources

#### 6.2.3.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 6.2.3.1-1 depicts the resource URIs structure for the Aimlec\_HFLTraining API.



**Figure 6.2.3.1-1: Resource URI structure of the Aimlec\_HFLTraining API**

Table 6.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 6.2.3.1-1: Resources and methods overview**

Resource name	Resource URI	HTTP method or custom operation	Description
HFL training subscription	/subscriptions	POST	Request the creation of the HFL training subscription resources.
Individual HFL training subscription	/subscriptions/{subscriptionId}	GET	Retrieve an existing "Individual HFL training subscription" resource.
		PUT	Request the full replacement of an existing "Individual HFL training subscription" resource.
		PATCH	Request the partial replacement of an existing "Individual HFL training subscription" resource.
		DELETE	Request the deletion of an existing "Individual HFL training subscription" resource.

### 6.2.3.2 Resource: HFL training subscription

#### 6.2.3.2.1 Description

This resource represents the AIMLE server subscription request to the HFL training event with the AIMLE client.

#### 6.2.3.2.2 Resource definition

Resource URI: **{apiRoot}/aimlec-hfl-trng/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 6.2.3.2.2-1.

**Table 6.2.3.2.2-1: Resource URI variables for this resource**

Name	Data type	Definition
apiRoot	string	See clause 6.2.1

#### 6.2.3.2.3 Resource standard methods

##### 6.2.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.2.3.2.3.1-1.

**Table 6.2.3.2.3.1-1: URI query parameters supported by the POST method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.2.3.2.3.1-2 and the response data structures and response codes specified in table 6.2.3.2.3.1-3.

**Table 6.2.3.2.3.1-2: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
HflTrngSub	M	1	Represents the " HFL training subscription" resource.

**Table 6.2.3.2.3.1-3: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
HflTrngSub	M	1	201 Created	Successful case. The creation of an Individual HFL training subscription resource is confirmed, and a representation of that resource is returned.  An HTTP "Location" header that contains the URI of the created resource shall also be included.
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.2.3.2.3.1-4: Headers supported by the 201 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/aimlec-hfl-trng/<apiVersion>/subscriptions/{subscriptionId}

#### 6.2.3.2.4 Resource custom operations

There are no resource custom operations defined for this resource in this release of the specification.

### 6.2.3.3 Resource: Individual HFL training subscription

#### 6.2.3.3.1 Description

This resource represents an individual HFL training subscription resource at a given AIMLE client.

#### 6.2.3.3.2 Resource definition

Resource URI: **{apiRoot}/aimles-hfl-trng/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 6.2.3.3.2-1.

**Table 6.2.3.3.2-1: Resource URI variables for this resource**

Name	Data type	Definition
apiRoot	string	See clause 6.2.1
subscriptionId	string	Represents the identifier of an "Individual HFL training subscription" resource.

## 6.2.3.3.3 Resource standard methods

## 6.2.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.2.3.3.3.1-1.

**Table 6.2.3.3.3.1-1: URI query parameters supported by the GET method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.2.3.3.3.1-2 and the response data structures and response codes specified in table 6.2.3.3.3.1-3.

**Table 6.2.3.3.3.1-2: Data structures supported by the GET Request Body on this resource**

Data type	P	Cardinality	Description
n/a			

**Table 6.2.3.3.3.1-3: Data structures supported by the GET Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
HflTrngSub	M	1	200 OK	Successful case. The requested "Individual HFL training subscription" resource is successfully retrieved and a representation of the updated resource shall be returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection.  The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client.  Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection.  The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client.  Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.2.3.3.3.1-4: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

**Table 6.2.3.3.3.1-5: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

## 6.2.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 6.2.3.3.3.2-1.

**Table 6.2.3.3.3.2-1: URI query parameters supported by the PUT method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.2.3.3.3.2-2 and the response data structures and response codes specified in table 6.2.3.3.3.2-3.

**Table 6.2.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource**

Data type	P	Cardinality	Description
HflTrngSub	M	1	Represents the complete update of the representation of the existing "Individual HFL training subscription" resource.

**Table 6.2.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
HflTrngSub	M	1	200 OK	Successful case. The requested "Individual HFL training subscription" resource is successfully updated and a representation of the updated resource shall be returned in the response body.
n/a			204 No Content	Successful case. The "Individual HFL training subscription" resource is successfully updated and no content is returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection.  The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client.  Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection.  The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client.  Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.2.3.3.3.2-4: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

**Table 6.2.3.3.3.2-5: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

### 6.2.3.3.3.3 PATCH

This method shall support the URI query parameters specified in table 6.2.3.3.3.3-1.

**Table 6.2.3.3.3.3-1: URI query parameters supported by the PATCH method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.2.3.3.3.3-2 and the response data structures and response codes specified in table 6.2.3.3.3.3-3.

**Table 6.2.3.3.3.3-2: Data structures supported by the PATCH Request Body on this resource**

Data type	P	Cardinality	Description
HflTrngSubPatch	M	1	Represents the parameters to request the modification of the "Individual HFL training subscription" resource.

**Table 6.2.3.3.3.3-3: Data structures supported by the PATCH Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
HflTrngSub	M	1	200 OK	Successful case. The "Individual HFL training subscription" resource is successfully modified and a representation of the updated resource shall be returned in the response body.
n/a			204 No Content	Successful case. The "Individual HFL training subscription" resource is successfully modified and no content is returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection.  The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client.  Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection.  The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client.  Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.2.3.3.3.3-4: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

**Table 6.2.3.3.3.3-5: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

#### 6.2.3.3.3.4 DELETE

This method shall support the URI query parameters specified in table 6.2.3.3.3.4-1.

**Table 6.2.3.3.3.4-1: URI query parameters supported by the DELETE method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.2.3.3.3.4-2 and the response data structures and response codes specified in table 6.2.3.3.3.4-3.

**Table 6.2.3.3.3.4-2: Data structures supported by the DELETE Request Body on this resource**

Data type	P	Cardinality	Description
n/a			

**Table 6.2.3.3.3.4-3: Data structures supported by the DELETE Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The "Individual HFL training subscription" resource is successfully deleted.
n/a			307 Temporary Redirect	Temporary redirection.  The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client.  Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection.  The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client.  Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.2.3.3.3.4-4: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

**Table 6.2.3.3.3.4-5: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

#### 6.3.3.3.4 Resource custom operations

There are no resource custom operations defined for this resource in this release of the specification.

## 6.2.4 Custom operations without associated resources

### 6.2.4.1 Overview

There are no custom operations without associated resources defined for this resource in this release of the specification.

## 6.2.5 Notifications

### 6.2.5.1 General

Notifications shall comply to clause 5.2.5 of 3GPP TS 29.122 [5].

**Table 6.2.5.1-1: Notifications overview**

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
HFL training event notification	{notifUri}	POST	This service operation enables the AIMLE client to notify the AIMLE server on HFL training event.

### 6.2.5.2 HFL training event notification

#### 6.2.5.2.1 Description

The HFL training event notification is used by the AIMLE client to report HFL training event to AIMLE server that has subscribed to such an event notification.

#### 6.2.5.2.2 Target URI

The Callback URI "{**notifUri**}" shall be used with the callback URI variables defined in table 6.2.5.2.2-1.

**Table 6.2.5.2.2-1: Callback URI variables**

Name	Definition
notifUri	The notification URI is assigned within the Individual HFL training subscription and described by the HflTrngSub structure data as specified in clause 6.2.6.2.2.

#### 6.2.5.2.3 Standard methods

##### 6.2.5.2.3.1 POST

This method shall support the request data structures specified in table 6.2.5.2.3.1-1 and the response data structures and response codes specified in table 6.2.5.2.3.1-1.

**Table 6.2.5.2.3.1-2: Data structures supported by the POST Request Body**

Data type	P	Cardinality	Description
HflTrngNotify	M	1	Represents the HFL training event notification.

**Table 6.2.5.2.3.1-3: Data structures supported by the POST Response Body**

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The HFL training event notification is successfully received and acknowledged.
n/a			307 Temporary Redirect	Temporary redirection.  The response shall include a Location header field containing an alternative URI representing the end point of an alternative AIMLE service consumer where the notification should be sent.  Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection.  The response shall include a Location header field containing an alternative URI representing the end point of an alternative AIMLE service consumer where the notification should be sent.  Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

## 6.2.6 Data model

### 6.2.6.1 General

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

Table 6.2.6.1-1 specifies the data types defined for the Aimlec\_HFLTraining API.

**Table 6.2.6.1-1: Aimlec\_HFLTraining API specific data types**

Data type	Clause defined	Description	Applicability
HflTrngNotify	6.2.6.2.4	Represent the information from an HFL training event notification.	
HflTrngSub	6.2.6.2.2	Represents the information for: - creation of the HFL training subscription resource; or - partial update or complete update of the existing HFL training subscription resource.	
HflTrngSubPatch	6.2.6.2.3	Represents the information for partial update of the existing HFL training subscription resource.	

Table 6.2.6.1-2 specifies data types re-used by the Aimlec\_HFLTraining API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the Aimlec\_HFLTraining API.

Table 6.2.6.1-2: Aimlec\_HFLTraining API re-used data types

Data type	Reference	Comments	Applicability
DateTime	3GPP TS 29.122 [5]	Used to represent the date and time.	
MLModelInfo	3GPP TS 29.482 [7]	Represents the ML model information.	
PerfParams	3GPP TS 29.482 [7]	Represents the output of training, e.g. ML model performance parameters for the training.	
ReportingRequirements	3GPP TS 29.549 [8]	Identifies the requirements for reporting.	
ScheduledCommunicationTime	3GPP TS 29.122 [5]	Represents an offered scheduled communication time.	
SupportedFeatures	3GPP TS 29.571 [9]	Used to negotiate the supported optional features of the API.	
TrainingErr	3GPP TS 29.482 [7]	Represents the error encountered during training.	
Uri	3GPP TS 29.122 [5]	Represents a URI.	

## 6.2.6.2 Structured data types

### 6.2.6.2.1 Introduction

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

#### 6.2.6.2.2 Type: HflTrngSub

Table 6.2.6.2.2-1: Definition of type HflTrngSub

Attribute name	Data type	P	Cardinality	Description	Applicability
requesterId	string	M	1	Contains the identifier of the service consumer. For the AIMLE client, e.g. unique client identifier. For the AIMLE server, e.g. FQDN, URI.	
notifUri	Uri	M	1	Identifies the URI towards which the notification should be delivered.	
aimlMdlInfo	MIModelInfo	M	1	Identifies the information about the AI/ML model and the model parameters which are to be used for the HFL training. This attribute shall be provided in the HTTP request.	
dataId	string	M	1	Identifies the dataset which is to be used for the HFL training. This attribute shall be provided in the HTTP request.	
noDataSamp	integer	M	1	Identifies the required number of samples for a round of the HFL training. This attribute shall be provided in the HTTP request.	
operSched	ScheduledCommunicationTime	O	0..1	Identifies the schedule for when the HFL training is to occur.	
notifReqs	ReportingRequirements	O	0..1	Identifies the requirements for the notifications.	
suppFeat	SupportedFeatures	C	0..1	Used to negotiate the applicability of optional features.  This attribute shall be present only if feature negotiation in clause 6.2.8 needs to take place. This attribute shall be provided in the HTTP request and in the HTTP response of successful resource creation.	
vaSrvId	string	M	1	Identifies the VAL service for the AIMLE HFL training operation. This parameter shall be supplied by the AMILE client in the HTTP response.	
subId	string	O	0..1	Identifies the subscription.	

## 6.2.6.2.3 Type: HflTrngSubPatch

**Table 6.2.6.2.3-1: Definition of type HflTrngSubPatch**

Attribute name	Data type	P	Cardinality	Description	Applicability
notifUri	Uri	O	0..1	Identifies the URI towards which the notification should be delivered.	
aimlMdlInfo	MIModelInfo	O	0..1	Identifies the information about the AI/ML model and the model parameters which are to be used for the HFL training.	
dataId	string	O	0..1	Identifies the dataset which is to be used for the HFL training.	
noDataSamp	integer	O	0..1	Identifies the required number of samples for a round of the HFL training.	
operSched	ScheduledCommunicationTime	O	0..1	Identifies the schedule for when the HFL training is to occur.	
notifReqs	ReportingRequirements	O	0..1	Identifies the requirements for the notifications.	

## 6.2.6.2.4 Type: HflTrngNotify

**Table 6.2.6.2.4-1: Definition of type HflTrngNotify**

Attribute name	Data type	P	Cardinality	Description	Applicability
vaSrvId	string	M	1	Identifies the VAL service for the AIMLE HFL training operation.	
hflTrngOut	PerfParams	M	1	Identifies the ML model parameters from the HFL training.	
hflTrngErr	TrainingErr	C	0..1	Identifies the encountered error list from the HFL training. This attribute shall be included if there is an encountered error list.	
timestamp	DateTime	O	0..1	Identifies timestamp for the notification.	

## 6.2.6.3 Simple data types and enumerations

## 6.2.6.3.1 Introduction

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

## 6.2.6.3.2 Simple data types

The simple data types defined in table 6.2.6.3.2-1 shall be supported.

**Table 6.2.6.3.2-1: Simple data types**

Type Name	Type Definition	Description	Applicability

## 6.2.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

## 6.2.6.5 Binary data

### 6.2.6.5.1 Binary data types

**Table 6.2.6.5.1-1: Binary data types**

Name	Clause defined	Content type

## 6.2.7 Error handling

### 6.2.7.1 General

For the Aimlec\_HFLTraining API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [5]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [5] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [5].

In addition, the requirements in the following clauses are applicable for the Aimlec\_HFLTraining API.

### 6.2.7.2 Protocol errors

No specific procedures for the Aimlec\_HFLTraining API are specified.

### 6.2.7.3 Application errors

The application errors defined for the Aimlec\_HFLTraining API are listed in Table 6.2.7.3-1.

**Table 6.2.7.3-1: Application errors**

Application Error	HTTP status code	Description

## 6.2.8 Feature negotiation

The optional features in table 6.2.8-1 are defined for the Aimlec\_HFLTraining API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [5].

**Table 6.2.8-1: Supported features**

Feature number	Feature Name	Description

## 6.2.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_HFLTraining API.

## 6.3 Aimles\_AIMLEClientRegistration API

### 6.3.1 Introduction

The AIMLE client registration service shall use the Aimles\_AIMLEClientRegistration API.

The API URI of the Aimles\_AIMLEClientRegistration API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>**

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [5].
- The <apiName> shall be "aimles-client-reg".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 6.3.3.

### 6.3.2 Usage of HTTP and common API related aspects

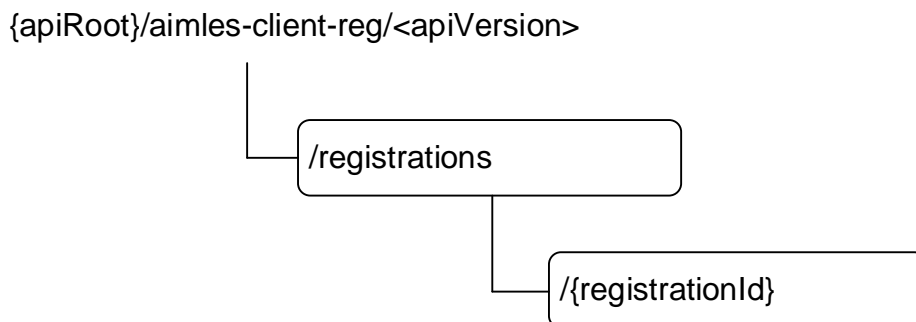
The provisions of clause 5.2 of 3GPP TS 29.122 [5] shall apply for the Aimles\_AIMLEClientRegistration API.

### 6.3.3 Resources

#### 6.3.3.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 6.3.3.1-1 depicts the resource URIs structure for the Aimles\_AIMLEClientRegistration API.



**Figure 6.3.3.1-1: Resource URI structure of the Aimles\_AIMLEClientRegistration API**

Table 6.3.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 6.3.3.1-1: Resources and methods overview**

Resource name	Resource URI	HTTP method or custom operation	Description
AIMLE client registrations	/registrations	POST	Registers the AIMLE client at the AIMLE server i.e. creates a new individual AIMLE client registration resource.
Individual AIMLE client registration	/registrations/{registrationId}	PUT	Fully replace an individual AIMLE client registration resource.
		DELETE	Deregisters the AIMLE client i.e. removes an individual AIMLE client registration resource.

### 6.3.3.2 Resource: AIMLE client registrations (Collection)

#### 6.3.3.2.1 Description

This resource represents all AIMLE clients that are registered at a given AIMLE server.

#### 6.3.3.2.2 Resource definition

Resource URI: **{apiRoot}/aimles-client-reg/<apiVersion>/registrations**

This resource shall support the resource URI variables defined in table 6.3.3.2.2-1.

**Table 6.3.3.2.2-1: Resource URI variables for this resource**

Name	Data type	Definition
apiRoot	string	See clause 6.3.1

#### 6.3.3.2.3 Resource standard methods

##### 6.3.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.3.3.2.3.1-1.

**Table 6.3.3.2.3.1-1: URI query parameters supported by the POST method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.3.3.2.3.1-2 and the response data structures and response codes specified in table 6.3.3.2.3.1-3.

**Table 6.3.3.2.3.1-2: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
AimleClientRegInfo	M	1	Contains information for the creation of a new individual AIMLE client registration resource.

**Table 6.3.3.2.3.1-3: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
AimleRegistration	M	1	201 Created	Successful case. An "Individual AIMLE client registration" resource is created, and a representation of that resource is returned.
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.3.3.2.3.1-4: Headers supported by the 201 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/aimles-client-reg/<apiVersion>/registrations/{registrationId}

#### 6.3.3.2.4 Resource custom operations

None.

### 6.3.3.3 Resource: Individual AIMLE client registration (Document)

#### 6.3.3.3.1 Description

This resource represents an individual AIMLE client registered at a given AIMLE server.

#### 6.3.3.3.2 Resource definition

Resource URI: {apiRoot}/aimles-client-reg/<apiVersion>/registrations/{registrationId}

This resource shall support the resource URI variables defined in table 6.3.3.3.2-1.

**Table 6.3.3.3.2-1: Resource URI variables for this resource**

Name	Data type	Definition
apiRoot	string	See clause 6.3.1
registrationId	string	The AIMLE client registration identifier.

#### 6.3.3.3.3 Resource standard methods

##### 6.3.3.3.3.1 PUT

This method shall support the URI query parameters specified in table 6.3.3.3.3.1-1.

**Table 6.3.3.3.3.1-1: URI query parameters supported by the PUT method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.3.3.3.3.1-2 and the response data structures and response codes specified in table 6.3.3.3.3.1-3.

**Table 6.3.3.3.3.1-2: Data structures supported by the PUT Request Body on this resource**

Data type	P	Cardinality	Description
AimleRegistration	M	1	Contains information for the update of individual AIMLE client registration resource.

**Table 6.3.3.3.1-3: Data structures supported by the PUT Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
AimleRegistration	M	1	200 OK	Successful case. An "Individual AIMLE client registration" resource is updated, and a representation of that resource is returned.
n/a			204 No Content	Successful case. An "Individual AIMLE client registration" resource is updated.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.3.3.3.1-4: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

**Table 6.3.3.3.1-5: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

#### 6.3.3.3.2 DELETE

This method shall support the URI query parameters specified in table 6.3.3.3.2-1.

**Table 6.3.3.3.2-1: URI query parameters supported by the DELETE method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.3.3.3.2-2 and the response data structures and response codes specified in table 6.3.3.3.2-3.

**Table 6.3.3.3.2-2: Data structures supported by the DELETE Request Body on this resource**

Data type	P	Cardinality	Description
n/a			

**Table 6.3.3.3.2-3: Data structures supported by the DELETE Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. An "Individual AIMLE client registration" resource is removed.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.3.3.3.2-4: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

**Table 6.3.3.3.2-5: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

#### 6.3.3.3.4 Resource custom operations

None.

### 6.3.4 Custom operations without associated resources

There are no custom operations without associated resources defined for this API in this release of the specification.

### 6.3.5 Notifications

There are no notifications defined for this API in this release of the specification.

### 6.3.6 Data model

#### 6.3.6.1 General

This clause specifies the application data model supported by the Aimles\_AIMLEClientRegistration API.

Table 6.3.6.1-1 specifies the data types defined for the Aimles\_AIMLEClientRegistration API.

**Table 6.3.6.1-1: Aimles\_AIMLEClientRegistration API specific Data Types**

Data type	Clause defined	Description	Applicability
AimleClientProfile	6.3.6.2.6	Contains the AIMLE client capability information e.g. supported AI/ML model types, AI/ML service operation type.	
AimleClientRegInfo	6.3.6.2.3	Contains the AIMLE client registration information.	
AimleRegistration	6.3.6.2.2	Represents an individual AIMLE client registration resource.	
AimlModelType	6.3.6.3.4	Represents the AI/ML model type.	
AimlOperation	6.3.6.3.5	Represents the AI/ML service operation type.	
ClientCapability	6.3.6.2.7	Contains the AIMLE client capability information.	
DataCapability	6.3.6.3.8	Contains a list of data capabilities.	
DataSetAvailability	6.3.6.2.8	Represents a dataset availability.	
LocationConfig	6.3.6.2.9	To be checked if needed.	
MLApplicationType	6.3.6.3.6	Represents the ML application type.	
ResourceUsageLevel	6.3.6.3.7	Represents the resource usage level.	
ServiceData	6.3.6.2.5	Contains VAL service identifier with the corresponding service permission.	
ServicePermissionLevel	6.3.6.3.3	Represents the service permission level.	
SupportedProfile	6.3.6.2.4	Contains AIMLE client profiles and supported service information.	
TaskCapability	6.3.6.3.9	Contains the AI/ML task performing capabilities.	

Table 6.3.6.1-2 specifies data types re-used by the Aimles\_AIMLEClientRegistration API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the Aimles\_AIMLEClientRegistration API.

**Table 6.3.6.1-2: Aimles\_AIMLEClientRegistration API re-used Data Types**

Data type	Reference	Comments	Applicability
DateTime	3GPP TS 29.122 [5]	Used to indicate an expiration time of the AIMLE client registration.	
LocationArea5G	3GPP TS 29.122 [5]	Used to indicate a location area represented as list of geographic areas, civic addresses and network area.	
ScheduledCommunicationTime	3GPP TS 29.571 [11]	Used to indicate the availability schedule of the AIMLE client for the AI/ML service.	
SupportedFeatures	3GPP TS 29.571 [11]	Used to negotiate the applicability of the optional features defined in table 6.3.8-1.	
Uri	3GPP TS 29.122 [5]	Used to indicate a URI.	
ValSvcAreald	3GPP TS 29.549 [9]	Used to indicate the VAL Service Area identifier.	
ValTargetUe	3GPP TS 29.549 [9]	Unique identifier of a VAL user or a VAL UE.	

## 6.3.6.2 Structured data types

### 6.3.6.2.1 Introduction

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

## 6.3.6.2.2 Type: AimleRegistration

**Table 6.3.6.2.2-1: Definition of type AimleRegistration**

Attribute name	Data type	P	Cardinality	Description	Applicability
regData	AimleClientRegInfo	M	1	Contains the AIMLE client registration information.	
expTime	DateTime	O	0..1	Identifies the expiration time for the AIMLE client registration. (NOTE)	
NOTE: If the AIMLE server did not include the expTime attribute in HTTP 200 and 201 responses, the registration of AIMLE client never expires.					

## 6.3.6.2.3 Type: AimleClientRegInfo

**Table 6.3.6.2.3-1: Definition of type AimleClientRegInfo**

Attribute name	Data type	P	Cardinality	Description	Applicability
aimleClientId	ValTargetUe	M	1	The AIMLE client identifier.	
suppProfiles	array(SupportedProfile)	M	1..N	Contains a list of supported service information and AIMLE client profiles.	
suppFeat	SupportedFeatures	C	0..1	Represents a list of supported features used as described in clause 6.3.8. This attribute shall be provided in the HTTP 201 response if it was provided in the POST request.	

## 6.3.6.2.4 Type: SupportedProfile

**Table 6.3.6.2.4-1: Definition of type SupportedProfile**

Attribute name	Data type	P	Cardinality	Description	Applicability
clientProfile	AimleClientProfile	C	0..1	Contains the AIMLE client capability information e.g. supported AI/ML model types, AI/ML service operation type. (NOTE)	
suppServices	array(ServiceData)	C	1..N	Contains the list of VAL services identifiers with corresponding service permissions. (NOTE)	
NOTE: This attribute shall be included in the HTTP POST request for the AIMLE client registration.					

## 6.3.6.2.5 Type: ServiceData

**Table 6.3.6.2.5-1: Definition of type ServiceData**

Attribute name	Data type	P	Cardinality	Description	Applicability
valServiceId	string	M	1	Represents the VAL service identifier.	
servPermLevel	ServicePermissionLevel	O	0..1	Represents the service permission level (e.g. allowed resource usage).	

## 6.3.6.2.6 Type: AimleClientProfile

Table 6.3.6.2.6-1: Definition of type AimleClientProfile

Attribute name	Data type	P	Cardinality	Description	Applicability
aimleClientUri	Uri	M	1	URI information of the AIMLE client.	
aimlModelTypes	array(AimlModelType)	O	1..N	Contains AI/ML model types supported by the AIMLE client (e.g. decision tree, linear regression, neural network).	
aimlOperations	array(AimlOperation)	M	1..N	Contains AI/ML operations supported by the AIMLE client (e.g. training, model transfer, model inference, model offload, model split, continue performing intermediate AI/ML operation).	
clientCap	ClientCapability	M	1	Contains the AIMLE client capability information (e.g. ML application type, allowed resource usage level).	
availTimeSchedCfgs	array(ScheduleCommunicationTime)	O	1..N	Contains the availability schedule of the AIMLE client for the AI/ML service, e.g. the AIMLE client is available to participate in the AI/ML operations in the given time slot(s) and/or day(s) of the week.	
unavblTimeSchedCfgs	array(ScheduleCommunicationTime)	O	1..N	Contains the unavailability schedule of the AIMLE client for the AI/ML service, e.g. the AIMLE client is not available to participate in the AI/ML operations in the given time slot(s) and/or day(s) of the week.	
availLocCfgs	array(LocationConfig)	O	1..N	Contains the available location-based configurations of the AIMLE client for the AI/ML service, e.g. the AI/ML member is available to participate in the AI/ML operations in the given locations represented by coordinates, civic addresses, network areas, or VAL service area ID.	
unavblLocCfgs	array(LocationConfig)	O	1..N	Contains the unavailable location-based configurations of the AIMLE client for the AI/ML service, e.g. the AI/ML member is not available to participate in the AI/ML operations in the given locations represented by coordinates, civic addresses, network areas, or VAL service area ID.	
dataSetAvail	DataSetAvailability	O	0..1	Contains a dataset availability such as dataset size, age, list of dataset features, and dataset identifiers.	
dataCap	array(DataCapability)	O	1..N	Contains a list of data capabilities such as the type of data that can be collected (e.g. raw data), supported data processing capabilities (e.g. processed data), and supported exploratory data analysis (EAD) functions.	
taskCaps	array(TaskCapability)	O	1..N	Contains the AI/ML task performing capabilities i.e. compute capabilities (e.g. high, low), task performance preference capabilities (e.g. low costs).	

## 6.3.6.2.7 Type: ClientCapability

**Table 6.3.6.2.7-1: Definition of type ClientCapability**

Attribute name	Data type	P	Cardinality	Description	Applicability
mlAppType	MLApplicationType	M	1	Contains the ML application type like FL (federated learning), TL (transfer learning), SL (split learning).	
rsrcUsageLvl	ResourceUsageLevel	M	1	Indicates allowed resource usage level.	

## 6.3.6.2.8 Type: DataSetAvailability

**Table 6.3.6.2.8-1: Definition of type DataSetAvailability**

Attribute name	Data type	P	Cardinality	Description	Applicability
dataSetIds	array(string)	M	1..N	Contains a list of dataset identifiers.	
size	integer	O	0..1	Represents the dataset size e.g. number of entries in dataset.	
age	integer	O	0..1	Represents the dataset age e.g. data set usage in number of days.	
features	array(string)	O	1..N	Contains a list of dataset features.	

## 6.3.6.2.9 Type: LocationConfig

**Table 6.3.6.2.9-1: Definition of type LocationConfig**

Attribute name	Data type	P	Cardinality	Description	Applicability
clientLoc	LocationArea5G	O	0..1	Contains the location-based configurations of the AIMLE client for the AI/ML service, e.g. locations represented by coordinates, civic addresses, and network area information.	
valSvcAreald	ValSvcAreald	O	0..1	Contains the VAL service area identifier.	

## 6.3.6.3 Simple data types and enumerations

## 6.3.6.3.1 Introduction

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

## 6.3.6.3.2 Simple data types

The simple data types defined in table 6.3.6.3.2-1 shall be supported.

**Table 6.3.6.3.2-1: Simple data types**

Type Name	Type Definition	Description	Applicability

## 6.3.6.3.3 Enumeration: ServicePermissionLevel

The enumeration ServicePermissionLevel represents a service permission level. It shall comply with the provisions defined in table 6.3.6.3.3-1.

**Table 6.3.6.3.3-1: Enumeration ServicePermissionLevel**

Enumeration value	Description	Applicability
PREMIUM_RESOURCE_USAGE		
STANDARD_RESOURCE_USAGE		
LIMITED_RESOURCE_USAGE		
OTHER_SERVICE_PERMISSION_LEVEL		

#### 6.3.6.3.4 Enumeration: AimlModelType

The enumeration AimlModelType represents AI/ML model types. It shall comply with the provisions defined in table 6.3.6.3.4-1.

**Table 6.3.6.3.4-1: Enumeration AimlModelType**

Enumeration value	Description	Applicability
DECISION_TREE	Indicates the decision tree type of the AI/ML model.	
LINEAR_REGRESSION	Indicates the linear regression type of the AI/ML model.	
NEURAL_NETWORK	Indicates the neural network type of the AI/ML model.	
OTHER_MODEL_TYPE	Indicates the other type of the AI/ML model.	

#### 6.3.6.3.5 Enumeration: AimlOperation

The enumeration AimlOperation represents the type of the AI/ML operation. It shall comply with the provisions defined in table 6.3.6.3.5-1.

**Table 6.3.6.3.5-1: Enumeration AimlOperation**

Enumeration value	Description	Applicability
MODEL_INFERENCE	Indicates the model inference type of the AI/ML operation.	
MODEL_OFFLOAD	Indicates the model offload type of the AI/ML operation.	
MODEL_SPLIT	Indicates the model split type of the AI/ML operation.	
MODEL_TRANSFER	Indicates the model transfer type of the AI/ML operation.	
MODEL_TRAINING	Indicates the model training type of the AI/ML operation.	
CONTINUE_PERFORM_INTERMEDIATE	Indicates the ability to continue performing of the intermediate AI/ML operation.	

#### 6.3.6.3.6 Enumeration: MIApplicationType

The enumeration MIApplicationType represents ML application types. It shall comply with the provisions defined in table 6.3.6.3.6-1.

**Table 6.3.6.3.6-1: Enumeration MIApplicationType**

Enumeration value	Description	Applicability
FEDERATED_LEARNING	Indicates federated learning ML application type.	
TRANSFER_LEARNING	Indicates transfer learning ML application type.	
SPLIT_LEARNING	Indicates split learning ML application type.	
OTHER_ML_APPLICATION_TYPE	Indicates other ML application type.	

#### 6.3.6.3.7 Enumeration: ResourceUsageLevel

The enumeration ResourceUsageLevel represents the resource usage level. It shall comply with the provisions defined in table 6.3.6.3.4-1.

**Table 6.3.6.3.4-1: Enumeration ResourceUsageLevel**

Enumeration value	Description	Applicability
PREMIUM_RESOURCE_USAGE		
STANDARD_RESOURCE_USAGE		
LIMITED_RESOURCE_USAGE		

**6.3.6.3.8 Enumeration: DataCapability**

The enumeration DataCapability represents data capabilities such as the type of data that can be collected (e.g. raw data), supported data processing capabilities (e.g. processed data), and supported exploratory data analysis functions. It shall comply with the provisions defined in table 6.3.6.3.8-1.

**Table 6.3.6.3.8-1: Enumeration DataCapability**

Enumeration value	Description	Applicability
RAW_DATA		
STRUCTURED_DATA		
SEMI_STRUCTURED_DATA		
UNSTRUCTURED_DATA		
PROCESSED_DATA		
EXPLOATORY_DATA_ANALYSIS		

**6.3.6.3.9 Enumeration: TaskCapability**

The enumeration TaskCapability represents AI/ML task performing capabilities. It includes compute capabilities (e.g. high, low), task performance preference capabilities. It shall comply with the provisions defined in table 6.3.6.3.9-1.

**Table 6.3.6.3.9-1: Enumeration TaskCapability**

Enumeration value	Description	Applicability
HIGH_COMPUTE_CAPABILITY		
LOW_COMPUTE_CAPABILITY		
LOW_COSTS_PERFORMANCE		
GREEN_TASK_PERFORMANCE (NOTE)		
ENERGY_EFFICIENT_PERFORMANCE (NOTE)		
NOTE: The client shall not include GREEN_TASK_PERFORMANCE and ENERGY_EFFICIENT_PERFORMANCE.		

**6.3.6.4 Data types describing alternative data types or combinations of data types**

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

**6.3.6.5 Binary data**

**6.3.6.5.1 Binary data types**

The binary data types defined in table 6.3.6.5.1-1 shall be supported.

**Table 6.3.6.5.1-1: Binary data types**

Name	Clause defined	Content type

## 6.3.7 Error handling

### 6.3.7.1 General

For the Aimles\_AIMLEClientRegistration API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [5]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [5] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [5].

In addition, the requirements in the following clauses are applicable for the Aimles\_AIMLEClientRegistration API.

### 6.3.7.2 Protocol Errors

No specific procedures for the Aimles\_AIMLEClientRegistration API are specified.

### 6.3.7.3 Application errors

The application errors defined for the Aimles\_AIMLEClientRegistration API are listed in table 6.3.7.3-1.

**Table 6.3.7.3-1: Application errors**

Application Error	HTTP status code	Description

## 6.3.8 Feature negotiation

The optional features in table 6.3.8-1 are defined for the Aimles\_AIMLEClientRegistration API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [5].

**Table 6.3.8-1: Supported Features**

Feature number	Feature Name	Description

## 6.3.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [5] shall apply for the Aimles\_AIMLEClientRegistration API.

## 6.4 Aimles\_SplitOpEvent API

See 3GPP TS 29.482 [7].

## 6.5 Aimles\_SplitOpPipeline API

### 6.5.1 Introduction

The AI/ML split operation pipeline shall use the Aimles\_SplitOpPipeline API.

The API URI of the Aimles\_SplitOpPipeline API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>**

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [5].
- The <apiName> shall be "aimles-sopl".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 6.5.3.

## 6.5.2 Usage of HTTP and common API related aspects

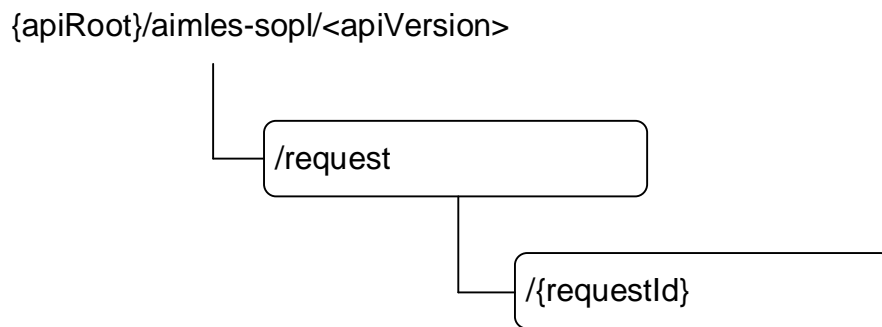
The provisions of clause 5.2 of 3GPP TS 29.122 [5] shall apply for the Aimles\_SplitOpPipeline API.

## 6.5.3 Resources

### 6.5.3.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 6.5.3.1-1 depicts the resource URIs structure for the Aimles\_SplitOpPipeline API.



**Figure 6.5.3.1-1: Resource URI structure of the Aimles\_SplitOpPipeline API**

Table 6.5.3.1-1 provides an overview of the resources and applicable HTTP methods.

**Table 6.5.3.1-1: Resources and methods overview**

Operation name	Custom operation URI	Mapped HTTP method	Description
AI/ML split operation pipeline creation	/request	POST	Used by the AIMLE client to create an instance of a split operation pipeline at the AIMLE server.
Individual AI/ML split operation pipeline creation	/request/{requestId}	PUT	Used by the AIMLE client to fully update an instance of a split operation pipeline at the AIMLE server
		DELETE	Used by the AIMLE client to delete an instance of a split operation pipeline at the AIMLE server
		PATCH	Used by the AIMLE client to partially fully update an instance of a split operation pipeline at the AIMLE server.

### 6.5.3.2 Resource: AIMLE split operation pipeline creation

#### 6.5.3.2.1 Description

This resource represents the AIMLE client split operation pipeline creation request resource at a given AIMLE server.

## 6.5.3.2.2 Resource definition

Resource URI: {apiRoot}/aimles-sopl/<apiVersion>/request

This resource shall support the resource URI variables defined in table 6.5.3.2.2-1.

**Table 6.5.3.2.2-1: Resource URI variables for this resource**

Name	Data type	Definition
apiRoot	string	See clause 6.5.1

## 6.5.3.2.3 Resource standard methods

## 6.5.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.5.3.2.3.1-1.

**Table 6.5.3.2.3.1-1: URI query parameters supported by the POST method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.5.3.2.3.1-2 and the response data structure and response codes specified in table 6.5.3.2.3.1-3.

**Table 6.5.3.2.3.1-2: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
SplitOpPipelineCreateReq	M	1	An individual AIMLE split operation pipeline creation resource to be created.

**Table 6.5.3.2.3.1-3: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
SplitOpPipelineCreateResp	M	1	201 Created	Successful case. An individual split operation pipeline creation resource is created successfully. The URI of the created resource shall be returned in the location HTTP header.
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.5.3.2.3.1-4: Headers supported by the 201 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/aimles-sopl/<apiVersion>/request

## 6.5.3.2.4 Resource custom operations

None.

### 6.5.3.3 Resource: Individual AIMLE split operation pipeline creation

#### 6.5.3.3.1 Description

This resource represents an individual AIMLE client split operation pipeline creation request resource at a given AIMLE server.

#### 6.5.3.3.2 Resource definition

Resource URI: **{apiRoot}/aimles-sopl/<apiVersion>/request/{requestId}**

This resource shall support the resource URI variables defined in table 6.5.3.3.2-1.

**Table 6.5.3.3.2-1: Resource URI variables for this resource**

Name	Data type	Definition
apiRoot	string	See clause 6.5.1
requestId	string	An individual AIMLE split operation pipeline creation request identifier.

#### 6.5.3.3.3 Resource standard methods

##### 6.5.3.3.3.1 PUT

This method shall support the URI query parameters specified in table 6.5.3.3.3.1-1.

**Table 6.5.3.3.3.1-1: URI query parameters supported by the PUT method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.5.3.3.3.1-2 and the response data structures and response codes specified in table 6.5.3.3.3.1-3.

**Table 6.5.3.3.3.1-2: Data structures supported by the PUT Request Body on this resource**

Data type	P	Cardinality	Description
SplitOpPipelineCreateReq	M	1	An individual instance of AIMLE split operation pipeline resource to be updated.

**Table 6.5.3.3.3.1-3: Data structures supported by the PUT Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
SplitOpPipelineCreateResp	M	1	200 OK	Successful case. An individual AIMLE split operation pipeline resource is updated, and a representation of that resource is returned.
n/a			204 No Content	Successful case. An individual AIMLE split operation pipeline resource is updated.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.5.3.3.3.1-4: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

**Table 6.5.3.3.3.1-5: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

#### 6.5.3.3.3.2 DELETE

This method shall support the URI query parameters specified in table 6.5.3.3.3.2-1.

**Table 6.5.3.3.3.2-1: URI query parameters supported by the DELETE method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.5.3.3.3.2-2 and the response data structures and response codes specified in table 6.5.3.3.3.2-3.

**Table 6.5.3.3.3.2-2: Data structures supported by the DELETE Request Body on this resource**

Data type	P	Cardinality	Description
n/a			

**Table 6.5.3.3.3.2-3: Data structures supported by the DELETE Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. An individual AIMLE split operation pipeline resource is removed.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.5.3.3.3.2-4: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

**Table 6.5.3.3.3.2-5: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

### 6.5.3.3.3.3 PATCH

This method shall support the URI query parameters specified in table 6.5.3.3.3.3-1.

**Table 6.5.3.3.3.3-1: URI query parameters supported by the PATCH method on this resource**

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 6.5.3.3.3.3-2 and the response data structures and response codes specified in table 6.5.3.3.3.3-3.

**Table 6.5.3.3.3.3-2: Data structures supported by the PATCH Request Body on this resource**

Data type	P	Cardinality	Description
SplitOpPipelinePatch	M	1	An individual instance of AIMLE split operation pipeline resource to be updated.

**Table 6.5.3.3.3-3: Data structures supported by the PATCH Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
SplitOpPipelineCreate Resp	M	1	200 OK	Successful case. An individual AIMLE split operation pipeline resource is updated, and a representation of that resource is returned.
n/a			204 No Content	Successful case. An individual AIMLE split operation pipeline resource is updated.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.5.3.3.3-4: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

**Table 6.5.3.3.3-5: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

#### 6.5.3.3.4 Resource custom operations

None.

### 6.5.4 Custom operations without associated resources

#### 6.5.4.1 Overview

**Table 6.5.4.1-1: Custom operations without associated resources**

Operation name	Custom operation URI	Mapped HTTP method	Description
AI/ML split operation discovery	/discovery	POST	Used by the AIMLE client or VAL server to communicate with the AIMLE server for split AI/ML operation pipeline discovery.

#### 6.5.4.2 Operation: AI/ML split operation discovery

##### 6.5.4.2.1 Description

The custom operation enables the AIMLE client to request the AIMLE server to perform the AI/ML split operation discovery.

### 6.5.4.2.2 Operation definition

This operation shall support the response data structures and response codes specified in tables 6.5.4.2.2-1 and 6.5.4.2.2-2.

**Table 6.5.4.2.2-1: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
SplitOpPipelineDiscReq	M	1	Contains the AIMLE split operation pipeline discovery request information.

**Table 6.5.4.2.2-2: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
SplitOpPipelineDiscResp	M	1	200 OK	Successful case. The AIMLE split operation pipeline discovery is performed.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.5.4.2.2-3: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

**Table 6.5.4.2.2-4: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

## 6.5.5 Notifications

There are no notifications defined for this API in this release of the specification.

## 6.5.6 Data Model

### 6.5.6.1 General

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

Table 6.5.6.1-1 specifies the data types defined for the Aimles\_SplitOpPipeline API.

**Table 6.5.6.1-1: Aimles\_SplitOpPipeline API specific Data Types**

Data type	Section defined	Description	Applicability
SplitOpPipelineCreateReq	6.5.6.2.2	Represents the AIMLE Split Operation Pipeline Create request.	
SplitOpPipelineCreateResp	6.5.6.2.3	Represents the AIMLE Split Operation Pipeline Create response	
SplitOpPipelinePatch	6.5.6.2.4	Represents the AIMLE Split Operation Pipeline Patch request.	
SplitOpPipelineDiscReq	6.5.6.2.5	Represents the AIMLE Split Operation Pipeline Discovery request.	
SplitOpPipelineDiscResp	6.5.6.2.6	Represents the AIMLE Split Operation Pipeline Discovery response.	
SplitOpRequirements	6.5.6.2.7	Represents the AIMLE Split Operation Pipeline requirements	

Table 6.5.6.1-2 specifies data types re-used by the Aimles\_SplitOpPipeline API service.

**Table 6.5.6.1-2: Aimles\_SplitOpPipeline API re-used Data Types**

Data type	Reference	Comments	Applicability
Uri	3GPP TS 29.122 [5]	Used to indicate the notification URI.	
UsageInformation	3GPP TS 29.482 [7]	Represents the usage information for the split AI/ML model.	
DiscFilters	3GPP TS 29.482 [7]	Represents the discovery filters to determine matching split operation profile or nodes.	
SplitOpPipelineInfo	3GPP TS 29.482 [7]	Represents split operation pipeline information.	
SplitOpProfile	3GPP TS 29.482 [7]	Represents the split operation profile that VAL server participates to.	
StageInfo	3GPP TS 29.482 [7]	Represents the information related to each stage in split operation pipeline.	
Endpoint	3GPP TS 29.558 [10]	Represent the endpoint information of a node.	

## 6.5.6.2 Structured data types

### 6.5.6.2.1 Introduction

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

### 6.5.6.2.2 Type: SplitOpPipelineCreateReq

**Table 6.5.6.2.2-1: Definition of type SplitOpPipelineCreateReq**

Attribute name	Data type	P	Cardinality	Description	Applicability
requestorId	string	M	1	Contains the identifier of the service consumer. For the AIMLE client, e.g. unique client identifier. For the AIMLE server, e.g. FQDN, URI.	
notifUri	Uri	M	1	Identifies the URI, towards which the notification should be delivered.	
splitOpRequirements	SplitOpRequirements	M	1	Contains the set of characteristics to determine matching split operation profiles or nodes.	

## 6.5.6.2.3 Type: SplitOpPipelineCreateResp

**Table 6.5.6.2.3-1: Definition of type SplitOpPipelineCreateResp**

Attribute name	Data type	P	Cardinality	Description	Applicability
splitOpProfile	SplitOpProfile	O	0..1	Contains the split operation profiles.	

## 6.5.6.2.4 Type: SplitOpPipelinePatch

**Table 6.5.6.2.4-1: Definition of type SplitOpPipelinePatch**

Attribute name	Data type	P	Cardinality	Description	Applicability
notifUri	Uri	M	1	Identifies the URI, towards which the notification should be delivered.	
splitOpPipelineId	string	M	1	Contains the identifier for split operation pipeline.	
splitOpPipelineInfo	SplitOpPipelineInfo	M	1	Contains split operation pipeline information.	

## 6.5.6.2.5 Type: SplitOpPipelineDiscReq

**Table 6.5.6.2.5-1: Definition of type SplitOpPipelineDiscReq**

Attribute name	Data type	P	Cardinality	Description	Applicability
notifUri	Uri	M	1	Identifies the URI, towards which the notification should be delivered.	
discFilters	DiscFilters	M	1	Contains the set of characteristics to determine matching split operation profiles or nodes.	

## 6.5.6.2.6 Type: SplitOpPipelineDiscResp

**Table 6.5.6.2.6-1: Definition of type SplitOpPipelineDiscResp**

Attribute name	Data type	P	Cardinality	Description	Applicability
discoveredNodes	array(string)	C	1..N	Contains the list of discovered nodes. (NOTE)	
splitOpProfiles	array(SplitOpProfile)	C	1..N	Contains the list of split operation profiles. (NOTE)	

NOTE: At least one of these attributes shall be present.

## 6.5.6.2.7 Type: SplitOpRequirements

**Table 6.5.6.2.7-1: Definition of type SplitOpRequirements**

Attribute name	Data type	P	Cardinality	Description	Applicability
stageInfo	array(StageInfo)	M	1..N	Contains information about split operation stages.	
usageInfo	UsageInformation	O	0..1	Contains information about planned usage of the split operation.	
notificationTarget	Endpoint	O	0..1	Contains information about the Endpoint where the result of the split operation is sent by the tail node.	

### 6.5.6.3 Simple data types and enumerations

#### 6.5.6.3.1 Introduction

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

#### 6.5.6.3.2 Simple data types

The simple data types defined in table 6.5.6.3.2-1 shall be supported.

**Table 6.5.6.3.2-1: Simple data types**

Type Name	Type Definition	Description	Applicability

#### 6.5.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

#### 6.5.6.5 Binary data

##### 6.5.6.5.1 Binary Data Types

**Table 6.5.6.5.1-1: Binary Data Types**

Name	Clause defined	Content type

### 6.5.7 Error Handling

#### 6.5.7.1 General

For the Aimles\_SplitOpPipeline API, HTTP error responses shall be supported as specified in clause 5.2.1.6 of 3GPP TS 29.122 [5]. Protocol errors and application errors specified in clause 5.2.1.6 of 3GPP TS 29.122 [5] shall be supported for the HTTP status codes specified in table 5.2.1.6-1 of 3GPP TS 29.122 [5].

In addition, the requirements in the following clauses are applicable for the Aimles\_SplitOpPipeline API.

#### 6.5.7.2 Protocol Errors

No specific protocol errors for the Aimles\_SplitOpPipeline API are specified.

#### 6.5.7.3 Application Errors

The application errors defined for Aimles\_SplitOpPipeline API are listed in table 6.5.7.3-1.

**Table 6.5.7.3-1: Application errors**

Application Error	HTTP status code	Description	Applicability

## 6.5.8 Feature negotiation

The optional features in table 6.5.8-1 are defined for the Aimles\_SplitOpPipeline API. They shall be negotiated using the extensibility mechanism defined clause 5.2.1.7 of 3GPP TS 29.122 [5].

**Table 6.5.8-1: Supported Features**

Feature number	Feature Name	Description

## 6.5.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [5] shall apply for the Aimles\_SplitOpPipeline API.

## 6.6 Aimlec\_FLGroupIndication API

### 6.6.1 Introduction

The FL group indication service shall use the Aimlec\_FLGroupIndication API.

The API URI of the AIML\_FederatedLearning API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>**

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [5].
- The <apiName> shall be "aimlec-flgi".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 6.6.4.

### 6.6.2 Usage of HTTP and common API related aspects

The provisions of clause 5.2 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_FLGroupIndication API.

### 6.6.3 Resources

#### 6.6.3.1 Overview

There are neither resources nor methods used for the service.

### 6.6.4 Custom operations without associated resources

#### 6.6.4.1 Overview

Table 6.6.4.1-1 provides an overview of the custom operations and applicable HTTP methods defined for the Aimlec\_FLGroupIndication API.

**Table 6.6.4.1-1: Custom operations without associated resources**

Operation name	Custom operation URI	Mapped HTTP method	Description
Indicate FL group	/indicate	POST	Used by the AIMLE server to indicate FL group information to the AIMLE client.

## 6.6.4.2 Operation: Indicate FL group

### 6.6.4.2.1 Description

The custom operation enables the AIMLE server to indicate the AIMLE client as the candidate FL member the information on the FL group.

### 6.6.4.2.2 Operation definition

This operation shall support the response data structures and response codes specified in tables 6.6.4.2.2-1, 6.6.4.2.2-2, 6.6.4.2.2-3, and 6.6.4.2.2-4.

**Table 6.6.4.2.2-1: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
IndFIMember	M	1	Information which shall be indicated to the FL members.

**Table 6.6.4.2.2-2: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Success. The indicated information on FL member group is successfully received, processed, and provisioned.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status code for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.6.4.2.2-3: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

**Table 6.6.4.2.2-4: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

## 6.6.5 Notifications

### 6.6.5.1 General

There are no notifications defined for the Aimlec\_FLGroupIndication API in this release of the specification.

## 6.6.6 Data model

### 6.6.6.1 General

This clause specifies the application data model supported by the Aimlec\_FLGroupIndication API.

Table 6.6.6.1-1 specifies the data types defined for the Aimlec\_FLGroupIndication API.

**Table 6.6.6.1-1: Aimlec\_FLGroupIndication API specific Data Types**

Data type	Clause defined	Description	Applicability
FIGroupDelCause	6.6.6.3.6	Represents the deletion cause for the FL group.	
FIGroupDeletionInfo	6.6.6.2.6	Represents the FL group deletion information.	
FIGroupInfo	6.6.6.2.3	Represents the FL group information.	
FIMemberAvailability	6.6.6.3.3	Indicates the FL member availability.	
FIMemberConstraint	6.6.6.3.4	Indicates the FL member constraint.	
FIMemberData	6.6.6.2.4	Represents the FL group member data e.g. FL member identifier, address.	
FIMemberInfo	6.6.6.2.5	Represents the FL member information e.g. availability, constraint, FL role.	
FIMemberRole	6.6.6.3.5	Indicates the FL member role.	
IndFIMember	6.6.6.2.2	Indicates the FL member the information on FL member group	

Table 6.6.6.1-2 specifies data types re-used by the Aimlec\_FLGroupIndication API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the Aimlec\_FLGroupIndication API.

**Table 6.6.6.1-2: Aimlec\_FLGroupIndication API re-used Data Types**

Data type	Reference	Comments	Applicability
TimeWindow	3GPP TS 29.122 [5]	Represents a time window.	
ValUeAddrInfo	3GPP TS 29.549 [9]	Represents VAL UE address information.	

### 6.6.6.2 Structured data types

#### 6.6.6.2.1 Introduction

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

## 6.6.6.2.2 Type: IndFIMember

Table 6.6.6.2.2-1: Definition of type IndFIMember

Attribute name	Data type	P	Cardinality	Description	Applicability
serverId	string	M	1	Identifier of the indicating AIMLE server	
valServiceId	string	C	0..1	Identifier of the VAL service for which the grouping indication is applied. (NOTE 1)	
mIModelId	string	C	0..1	Identifier of the ML model for which the indication is applied. (NOTE 1)	
analyticsId	string	C	0..1	Identifier of the UE-to-UE session analytics, the FL grouping is based on, if the FL process is used for that of the UE-to-UE session analytics. (NOTE 1)	
flGroupIds	array(FIGroupInfo)	M	1..N	Identifiers of one or more AIMLE created or modified FL group for the FL process	
flGroupDelInfo	FIGroupDeletionInfo	C	0..1	Indicates the FL group is going to be deleted. (NOTE 2)	
NOTE 1: One of the attributes "valServiceId", "mIModelId", or "analyticsId" shall be present if the FL group indication is related to FL group creation or change.					
NOTE 2: The "flGroupDelInfo" attribute shall be present if the indication is related to an FL group deletion.					

## 6.6.6.2.3 Type: FIGroupInfo

Table 6.6.6.2.3-1: Definition of type FIGroupInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
flGroupId	string	M	1	Contains the FL group identifier.	
flMembers	array(FIMemberData)	O	1..N	Contains FL member data e.g. FL member identifier, address.	

## 6.6.6.2.4 Type: FIMemberData

Table 6.6.6.2.4-1: Definition of type FIMemberData

Attribute name	Data type	P	Cardinality	Description	Applicability
flMemberId	string	C	0..1	Identifier of FL member (NOTE)	
flMemberAddr	ValueAddrInfo	C	0..1	Address information of FL member (NOTE)	
flMemberInfo	FIMemberInfo	O	0..1	Information on FL members	
NOTE: At least one of the "flMemberId" and "flMemberAddr" attributes shall be present.					

## 6.6.6.2.5 Type: FIMemberInfo

Table 6.6.6.2.5-1: Definition of type FIMemberInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
availability	FIMemberAvailability	O	0..1	Represents the FL group member availability.	
constraints	array(FIMemberConstraint)	O	1..N	Represents the FL group member constraints.	
role	FIMemberRole	O	0..1	Represents the FL group member role/type.	

## 6.6.6.2.6 Type: FIGroupDeletionInfo

**Table 6.6.6.2.6-1: Definition of type FIGroupDeletionInfo**

Attribute name	Data type	P	Cardinality	Description	Applicability
cause	FIGroupDelCause	O	0..1	Represents the cause for the FL group deletion.	
expTime	TimeWindow	O	0..1	Represents the expiration time of the FL members group deletion (e.g. due to AI/ML service termination or group UE mobility to different service area). If the expTime attribute is not included, the deletion of the group is instant.	

## 6.6.6.3 Simple data types and enumerations

## 6.6.6.3.1 Introduction

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

## 6.6.6.3.2 Simple data types

The simple data types defined in table 6.6.6.3.2-1 shall be supported.

**Table 6.6.6.3.2-1: Simple data types**

Type Name	Type Definition	Description	Applicability

## 6.6.6.3.3 Enumeration: FIMemberAvailability

The enumeration FIMemberAvailability represents information regarding FL member availability of the VAL UE. It shall comply with the provisions defined in table 6.6.6.3.3-1.

**Table 6.6.6.3.3-1: Enumeration FIMemberAvailability**

Enumeration value	Description	Applicability
AVAILABLE	The FL member is available.	
NOT_AVAILABLE	The FL member is not available.	

## 6.6.6.3.4 Enumeration: FIMemberConstraint

The enumeration FIMemberConstraint represents an FL member constraint information of the VAL UE. It shall comply with the provisions defined in table 6.6.6.3.4-1.

**Table 6.6.6.3.4-1: Enumeration FIMemberConstraint**

Enumeration value	Description	Applicability
LIMITED_MEMORY	Indicates a limited memory load.	
LIMITED_PROCESSING	Indicates a limited processing power.	
LIMITED_ACCESS	Indicates a limited access to only the local data.	

## 6.6.6.3.5 Enumeration: FIMemberRole

The enumeration FIMemberRole represents an FL member role of the VAL UE. It shall comply with the provisions defined in table 6.6.6.3.5-1.

**Table 6.6.6.3.5-1: Enumeration FIMemberRole**

Enumeration value	Description	Applicability
FL_CLIENT	Indicates an FL client role.	
FL_SERVER	Indicates an FL server role.	
FL_AGGREGATOR	Indicates an FL aggregator role.	

#### 6.6.6.3.6 Enumeration: FIGroupDelCause

The enumeration FIGroupDelCause represents the deletion cause for the FL group. It shall comply with the provisions defined in table 6.6.6.3.6-1.

**Table 6.6.6.3.6-1: Enumeration FIGroupDelCause**

Enumeration value	Description	Applicability
SRV_TERMINATION	Indicates the AI/ML service termination.	
OUT_OF_SRV_AREA	Indicates the UE has moved out of the service area.	

#### 6.6.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combination of data types for Aimlec\_FLGroupIndication API in this release of the specification.

#### 6.6.6.5 Binary data

##### 6.6.6.5.1 Binary data types

The binary data types defined in table 6.6.6.5.1-1 shall be supported.

**Table 6.6.6.5.1-1: Binary data types**

Name	Clause defined	Content type

#### 6.6.7 Error handling

##### 6.6.7.1 General

For the Aimlec\_FLGroupIndication API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [5]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [5] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [5].

In addition, the requirements in the following clauses are applicable for the Aimlec\_FLGroupIndication API.

##### 6.6.7.2 Protocol errors

No specific procedures for the Aimlec\_FLGroupIndication API are specified in this release of the specification.

##### 6.6.7.3 Application errors

The application errors defined for the Aimlec\_FLGroupIndication API are listed in Table 6.6.7.3-1.

**Table 6.6.7.3-1: Application errors**

Application Error	HTTP status code	Description

## 6.6.8 Feature negotiation

The optional features in table 6.6.8-1 are defined for the Aimlec\_FLGroupIndication API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [5].

**Table 6.6.8-1: Supported Features**

Feature number	Feature Name	Description

## 6.6.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_FLGroupIndication API.

## 6.7 Aimlec\_ClientDataProcessing API

### 6.7.1 Introduction

The client data processing service shall use the Aimlec\_ClientDataProcessing API.

The API URI of the Aimlec\_ClientDataProcessing API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>**

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [5].
- The <apiName> shall be "aimlec-data-proc".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 6.7.4.

### 6.7.2 Usage of HTTP and common API related aspects

The provisions of clause 5.2 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_ClientDataProcessing API.

### 6.7.3 Resources

#### 6.7.3.1 Overview

There are neither resources nor methods used for the service.

### 6.7.4 Custom operations without associated resources

#### 6.7.4.1 Overview

Table 6.7.4.1-1 provides an overview of the custom operations and applicable HTTP methods defined for the Aimlec\_ClientDataProcessing API.

**Table 6.7.4.1-1: Custom operations without associated resources**

Operation name	Custom operation URI	Mapped HTTP method	Description
Trigger client data processing	/trigger	POST	Used by the AIMLE server to trigger the AIMLE client for the client data processing.

## 6.7.4.2 Operation: Trigger client data processing

### 6.7.4.2.1 Description

The custom operation enables the AIMLE server to trigger the AIMLE client for the client data processing which includes the data preparation or the data analysis.

### 6.7.4.2.2 Operation definition

This operation shall support the response data structures and response codes specified in tables 6.7.4.2.2-1 and 6.7.4.2.2-2, 6.7.4.2.2-3, and 6.7.4.2.2-4.

**Table 6.7.4.2.2-1: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
ClitDataProcReq	M	1	Information which shall be used to trigger the client data processing.

**Table 6.7.4.2.2-2: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
ClitDataProcResp			200 OK	Successful case. The requested client data processing is successfully received and processed, and the processed data and optionally a timestamp shall be returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].

NOTE: The mandatory HTTP error status code for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.

**Table 6.7.4.2.2-3: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

**Table 6.7.4.2.2-4: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

## 6.7.5 Notifications

### 6.7.5.1 General

There are no notifications defined for the Aimlec\_ClientDataProcessing API in this release of the specification.

## 6.7.6 Data model

### 6.7.6.1 General

This clause specifies the application data model supported by the Aimlec\_ClientDataProcessing API.

Table 6.7.6.1-1 specifies the data types defined for the Aimlec\_ClientDataProcessing API.

**Table 6.7.6.1-1: Aimlec\_ClientDataProcessing API specific Data Types**

Data type	Clause defined	Description	Applicability
CltDataProcReq	6.7.6.2.2	Represents triggering information for client data processing.	
CltDataProcResp	6.7.6.2.3	Represents the outcome of the successful client data processing.	

Table 6.7.6.1-2 specifies data types re-used by the Aimlec\_ClientDataProcessing API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the Aimlec\_ClientDataProcessing API.

**Table 6.7.6.1-2: Aimlec\_ClientDataProcessing API re-used Data Types**

Data type	Reference	Comments	Applicability
AggregatedDataAnaOutputs	3GPP TS 29.482 [7]	Represents the AIMLE Aggregated Data Analysis Output.	
AggregatedDataPrepOutputs	3GPP TS 29.482 [7]	Represents the AIMLE Aggregated Data Preparation Output.	
DataMgmtOp	3GPP TS 29.482 [7]	Represents the type of the client data processing.	
DataProcessReqs	3GPP TS 29.482 [7]	Represents the data preparation requirement.	
DateTime	3GPP TS 29.122 [5]	Used to represent the date and time.	
ScheduledCommunicationTime	3GPP TS 29.122 [5]	Used to define the schedules for traffic pattern configurations.	

### 6.7.6.2 Structured data types

#### 6.7.6.2.1 Introduction

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

## 6.7.6.2.2 Type: CltDataProcReq

**Table 6.7.6.2.2-1: Definition of type CltDataProcReq**

Attribute name	Data type	P	Cardinality	Description	Applicability
requesterId	string	M	1	Contains the identifier of the service consumer. For the AIMLE client, e.g. unique client identifier. For the AIMLE server, e.g. FQDN, URI.	
dataProc	DataMgmtOp	M	1	Identifies the type of the client data processing i.e. the data preparation or the data analysis.	
dataPrepReqs	DataProcessReqs	C	0..1	Identifies the data preparation requirements for the client data processing. (NOTE)	
dataAnalysisReqs	DataProcessReqs	C	0..1	Identifies the data analysis requirements for the client data processing. (NOTE)	
dataProcSched	ScheduledCommunicationTime	O	0..1	Identifies the schedule for the client data processing.	
NOTE: At least one of the "dataPrepReqs" or "dataAnalysisReqs" attributes shall be present.					

## 6.7.6.2.3 Type: CltDataProcResp

**Table 6.7.6.2.3-1: Definition of type CltDataProcResp**

Attribute name	Data type	P	Cardinality	Description	Applicability
dataPrepOutputs	AggregatedDataPrepOutputs	C	1..N	Identifies one or more outputs for the client data processing, where each output is w.r.t. a data preparation requirement. (NOTE)	
dataAnalysisOutputs	AggregatedDataAnaOutputs	C	1..N	Identifies one or more outputs for the client data processing, where each output is w.r.t. a data analysis requirement. (NOTE)	
timestamp	DateTime	O	0..1	Identifies the timestamp for the client data processing.	
NOTE: At least one of the "dataPrepOutputs" or "dataAnalysisOutput" attributes shall be present.					

## 6.7.6.3 Simple data types and enumerations

## 6.7.6.3.1 Introduction

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

## 6.7.6.3.2 Simple data types

The simple data types defined in table 6.7.6.3.2-1 shall be supported.

**Table 6.7.6.3.2-1: Simple data types**

Type Name	Type Definition	Description	Applicability

## 6.7.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combination of data types for Aimlec\_ClientDataProcessing API in this release of the specification.

## 6.7.6.5 Binary data

### 6.7.6.5.1 Binary data types

The binary data types defined in table 6.7.6.5.1-1 shall be supported.

**Table 6.7.6.5.1-1: Binary data types**

Name	Clause defined	Content type

## 6.7.7 Error handling

### 6.7.7.1 General

For the Aimlec\_ClientDataProcessing API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [5]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [5] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [5].

In addition, the requirements in the following clauses are applicable for the Aimlec\_ClientDataProcessing API.

### 6.7.7.2 Protocol errors

No specific procedures for the Aimlec\_ClientDataProcessing API are specified in this release of the specification.

### 6.7.7.3 Application errors

The application errors defined for the Aimlec\_ClientDataProcessing API are listed in Table 6.7.7.3-1.

**Table 6.7.7.3-1: Application errors**

Application Error	HTTP status code	Description

## 6.7.8 Feature negotiation

The optional features in table 6.7.8-1 are defined for the Aimlec\_ClientDataProcessing API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [5].

**Table 6.7.8-1: Supported Features**

Feature number	Feature Name	Description

## 6.7.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_ClientDataProcessing API.

## 6.8 Aimlec\_MLModTngCapEva API

### 6.8.1 Introduction

The ML model training capability evaluation service shall use the Aimlec\_MLModTngCapEva API.

The API URI of the Aimlec\_MLModTngCapEva API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>**

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [5].
- The <apiName> shall be "aimlec-ml-mtce".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 6.8.4.

## 6.8.2 Usage of HTTP and common API related aspects

The provisions of clause 5.2 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_MLModTngCapEva API.

## 6.8.3 Resources

There are no resources defined for this API in this release of the specification.

## 6.8.4 Custom operations without associated resources

### 6.8.4.1 Overview

**Table 6.8.4.1-1: Custom operations without associated resources**

Operation name	Custom operation URI	Mapped HTTP method	Description
ML model training capability evaluation request	/request	POST	Enables the AIMLE server to request the AIMLE client to perform ML model training capability evaluation service operation.

### 6.8.4.2 Operation: ML model training capability evaluation request

#### 6.8.4.2.1 Description

The custom operation enables the AIMLE server to request the AIMLE client to perform the ML model training capability evaluation service operation.

#### 6.8.4.2.2 Operation definition

This operation shall support the response data structures and response codes specified in tables 6.8.4.2.2-1 and 6.8.4.2.2-2.

**Table 6.8.4.2.2-1: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
MIModTngCapEvalReq	M	1	Contains the ML model training capability evaluation request information.

**Table 6.8.4.2.2-2: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
MIModTngCapEvalResp	M	0..1	200 OK	Contains the ML model training capability evaluation response information.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.8.4.2.2-3: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

**Table 6.8.4.2.2-4: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

## 6.8.5 Notifications

There are no notifications defined for this API in this release of the specification.

## 6.8.6 Data model

### 6.8.6.1 General

This clause specifies the application data model supported by the Aimlec\_MLModTngCapEva API.

Table 6.8.6.1-1 specifies the data types defined for the Aimlec\_MLModTngCapEva API.

**Table 6.8.6.1-1: Aimlec\_MLModTngCapEva API specific Data Types**

Data type	Clause defined	Description	Applicability
AimlModelData	6.8.6.2.4	Contains the AI/ML model information and model parameters for use in FL training.	
CapEvalOutcome	6.8.6.3.3	Indicates the outcome of the ML model training capability evaluation.	
DataSetRequirements	6.8.6.2.5	Contains requirements on data set for FL training.	
DomainFeatures	6.8.6.2.6	Contains a list of features for each data domain(s) of the datasets at the UE.	
MIModTngCapEvalReq	6.8.6.2.2	Contains the ML model training capability evaluation request information.	
MIModTngCapEvalResp	6.8.6.2.3	Contains the ML model training capability evaluation response information.	

Table 6.8.6.1-2 specifies data types re-used by the Aimlec\_MLModTngCapEva API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the Aimlec\_MLModTngCapEva API.

**Table 6.8.6.1-2: Aimlec\_MLModTngCapEva API re-used Data Types**

Data type	Reference	Comments	Applicability
AimlModelType	6.3.6.3.4	Used to indicate a type of the AI/ML model.	
MLModelProfile	3GPP TS 29.482 [7]	Used to indicate an ML model profile.	
TimeWindow	3GPP TS 29.122 [5]	Used to indicate a time window.	

## 6.8.6.2 Structured data types

### 6.8.6.2.1 Introduction

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

#### 6.8.6.2.2 Type: MIModTngCapEvalReq

**Table 6.8.6.2.2-1: Definition of type MIModTngCapEvalReq**

Attribute name	Data type	P	Cardinality	Description	Applicability
aimleServerId	string	M	1	The AIMLE server identifier.	
availTime	TimeWindow	O	0..1	Indicates the requested available time to support FL operation.	
testTask	string	O	0..1	Represents the task for test ML model training capability. (NOTE)	
modelInfo	AimlModelData	O	0..1	Contains the AI/ML model information and model parameters for use in the FL training process.	
dataSetReq	DataSetRequirements	O	0..1	Contains requirements on data set for FL training.	

NOTE: The detail content of the "testTask" attribute is implementation dependent.

#### 6.8.6.2.3 Type: MIModTngCapEvalResp

**Table 6.8.6.2.3-1: Definition of type MIModTngCapEvalResp**

Attribute name	Data type	P	Cardinality	Description	Applicability
capEvalOut	CapEvalOutcome	M	1	Indicates the outcome of the ML model training capability evaluation.	
testResult	string	C	0..1	Contains the test result of the ML model training capability evaluation. If the "capEvalOut" indicates the ability to join the FL training process the "testResult" attribute shall be included. (NOTE)	
evalFailInd	string	C	0..1	Contains the reason for inability to join the FL training process. If the "capEvalOut" indicates the inability to join the FL training process the "evalFailInd" attribute shall be included. (NOTE)	

NOTE: The detail content of this attribute is implementation dependent and depends on the information provided in the MIModTngCapEvalReq data type.

## 6.8.6.2.4 Type: AimlModelData

**Table 6.8.6.2.4-1: Definition of type AimlModelData**

Attribute name	Data type	P	Cardinality	Description	Applicability
aimlModels	array(AimlModelInfo)	O	1..N	Contains information about the AI/ML model. (NOTE 1)	
mlModelParams	array(string)	O	1..N	Contains model parameters for use in FL training. (NOTE 2)	
NOTE 1: For the HFL only one AI/ML model shall be present. For the VFL more than one AI/ML model may be present.					
NOTE 2: The detail content of the "mlModelParams" attribute is implementation dependent.					

## 6.8.6.2.5 Type: DataSetRequirements

**Table 6.8.6.2.5-1: Definition of type DataSetRequirements**

Attribute name	Data type	P	Cardinality	Description	Applicability
commonFtlds	array(string)	O	1..N	Contains a list of the features identifiers of the required features common to the dataset of the different data domains. (NOTE 1)	
domainFts	array(DomainFeatures)	O	1..N	Contains a list of features for each data domain(s) of the datasets at the UE. (NOTE 1)	
dataSource	string	O	0..1	Contains the identifier of a data source for the FL training (e.g. SEAL server, SEAL client, other NF entity, etc.). (NOTE 2)	
NOTE 1: For the VFL at least one of the "commonFtlds" and "domainFts" attributes shall be present.					
NOTE 2: The "dataSource" attribute shall be present for the HFL and may be present for the VFL.					

## 6.8.6.2.6 Type: DomainFeatures

**Table 6.8.6.2.6-1: Definition of type DomainFeatures**

Attribute name	Data type	P	Cardinality	Description	Applicability
domain	string	M	1	Represents a data domain i.e. a specific category of data or logical groupings of data that all relate together (e.g. customer data, product data, etc.).	
featurelds	array(string)	M	1..N	Represents a list of the features identifiers for the data domain of the datasets at the UE.	

## 6.8.6.2.7 Type: AimlModelInfo

**Table 6.8.6.2.7-1: Definition of type AimlModelInfo**

Attribute name	Data type	P	Cardinality	Description	Applicability
aimlModelType	AimlModelType	O	0..1	Contains AI/ML model type (e.g. decision tree, linear regression, neural network).	
mlModelProf	MLModelProfile	O	0..1	Contains ML model profile data e.g. ML model profile identifier, ML model address, ML model information, AIMLE server identifier, ML repository identifier.	

### 6.8.6.3 Simple data types and enumerations

#### 6.8.6.3.1 Introduction

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

#### 6.8.6.3.2 Simple data types

The simple data types defined in table 6.8.6.3.2-1 shall be supported.

**Table 6.8.6.3.2-1: Simple data types**

Type Name	Type Definition	Description	Applicability

#### 6.8.6.3.3 Enumeration: CapEvalOutcome

The enumeration CapEvalOutcome represents the outcome of the ML model training capability evaluation. It shall comply with the provisions defined in table 6.8.6.3.3-1.

**Table 6.8.6.3.3-1: Enumeration CapEvalOutcome**

Enumeration value	Description	Applicability
ABILITY_TO_JOIN	Indicates ability to join the training process.	
FIRST_MATCH	Indicates inability to join the training process.	

#### 6.8.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

#### 6.8.6.5 Binary data

##### 6.8.6.5.1 Binary data types

The binary data types defined in table 6.8.6.5.1-1 shall be supported.

**Table 6.8.6.5.1-1: Binary data types**

Name	Clause defined	Content type

### 6.8.7 Error handling

#### 6.8.7.1 General

For the Aimlec\_MLModTngCapEva API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [5]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [5] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [5].

In addition, the requirements in the following clauses are applicable for the Aimlec\_MLModTngCapEva API.

#### 6.8.7.2 Protocol errors

No specific procedures for the Aimlec\_MLModTngCapEva API are specified.

### 6.8.7.3 Application errors

The application errors defined for the Aimlec\_MLModTngCapEva API are listed in table 6.8.7.3-1.

**Table 6.8.7.3-1: Application errors**

Application Error	HTTP status code	Description

## 6.8.8 Feature negotiation

The optional features in table 6.8.8-1 are defined for the Aimlec\_MLModTngCapEva API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [5].

**Table 6.8.8-1: Supported Features**

Feature number	Feature Name	Description

## 6.8.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_MLModTngCapEva API.

## 6.9 Aimles\_UeTLModelSelectionAssistance API

### 6.9.1 Introduction

The TL enablement service shall use the Aimles\_UeTLModelSelectionAssistance API.

The API URI of the Aimles\_UeTLModelSelectionAssistance API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>**

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [5].
- The <apiName> shall be "aimles-ue-tl-msa".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 6.9.4.

### 6.9.2 Usage of HTTP and common API related aspects

The provisions of clause 5.2 of 3GPP TS 29.122 [5] shall apply for the Aimles\_UeTLModelSelectionAssistance API.

## 6.9.3 Resources

### 6.9.3.1 Overview

There are neither resources nor methods used for the service.

## 6.9.4 Custom operations without associated resources

### 6.9.4.1 Overview

Table 6.9.4.1-1 provides an overview of the custom operations and applicable HTTP methods defined for the Aimles\_UeTLModelSelectionAssistance API.

**Table 6.9.4.1-1: Custom operations without associated resources**

Operation name	Custom operation URI	Mapped HTTP method	Description
TL model selection assistance	/assist-tlms	POST	Used by the AIMLE client to request the AIMLE server to perform TL enablement service.

### 6.9.4.2 Operation: TL model selection assistance

#### 6.9.4.2.1 Description

The custom operation enables the AIMLE client to request the AIMLE server to provide one or more pre-trained ML models for the TL enablement service.

#### 6.9.4.2.2 Operation definition

This operation shall support the response data structures and response codes specified in tables 6.9.4.2.2-1, 6.9.4.2.2-2, 6.9.4.2.2-3, and 6.9.4.2.2-4.

**Table 6.9.4.2.2-1: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
TIModelSelectAssistReq	M	1	Contains information to trigger TL enablement service.

**Table 6.9.4.2.2-2: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
TIModelSelectAssistResp			200 OK	Successful case. The TL enablement service is performed.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status code for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.9.4.2.2-3: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

**Table 6.9.4.2.2-4: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

## 6.9.5 Notifications

There are no notifications defined for this API in this release of the specification.

## 6.9.6 Data model

### 6.9.6.1 General

This clause specifies the application data model supported by the Aimles\_UeTLModelSelectionAssistance API.

Table 6.9.6.1-1 specifies the data types defined for the Aimles\_UeTLModelSelectionAssistance API.

**Table 6.9.6.1-1: Aimles\_UeTLModelSelectionAssistance API specific Data Types**

Data type	Clause defined	Description	Applicability
AccessType	6.9.6.2.6	Contains permission and restriction to access the pre-trained model.	
EnvironmentType	6.9.6.3.4	Contains the environment for the target ML task.	
MLModel	6.9.6.2.5	Contains the pre-trained ML models for the TL enablement service.	
TICriteria	6.9.6.2.4	Contains the criteria for transfer learning.	
TIModelSelectAssistReq	6.9.6.2.2	Contains information to trigger TL enablement service.	
TIModelSelectAssistResp	6.9.6.2.3	Contains one or more pre-trained ML model for the TL enablement service.	
TIType	6.9.6.3.3	Contains the type of the transfer learning.	

Table 6.9.6.1-2 specifies data types re-used by the Aimles\_UeTLModelSelectionAssistance API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the Aimles\_UeTLModelSelectionAssistance API.

**Table 6.9.6.1-2: Aimles\_UeTLModelSelectionAssistance API re-used Data Types**

Data type	Reference	Comments	Applicability
MLModelProfile	3GPP TS 29.482 [7]	Used to indicate an ML model profile.	
UInt32	3GPP TS 29.571 [11]	Integer where the allowed values correspond to the value range of an unsigned 32-bit integer.	
ValTargetUe	3GPP TS 29.549 [9]	Unique identifier of a VAL user or a VAL UE.	

### 6.9.6.2 Structured data types

#### 6.9.6.2.1 Introduction

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

## 6.9.6.2.2 Type: TIModelSelectAssistReq

**Table 6.9.6.2.2-1: Definition of type TIModelSelectAssistReq**

Attribute name	Data type	P	Cardinality	Description	Applicability
serverId	string	M	1	Identifies the AIMLE server	
valSrvId	string	M	1	Identifying the VAL service, for which the TL enablement service is requested.	
tlCriteria	TICriteria	M	1	Identifying the criteria for transfer learning, for which the TL enablement service is requested.	
mlTaskId	string	O	0..1	Identifying the ML task, for which the TL enablement service is requested. (NOTE)	
adaeAnalyticsId	string	O	0..1	Identifying the ADAE analytics, for which the TL enablement service is requested. (NOTE)	
mlModelProfile	MIModelProfile	O	0..1	Identifying the ML model profile, for which the TL enablement service is requested. (NOTE)	
mlModelReq	array(string)	O	0..N	Identifying the requirements for the ML model, for which the TL enablement service is requested.	
valUeIds	array(ValTargetUe)	O	0..N	Identifying a list of one or more VAL UEs associated with the target ML task, for which one or more pre-trained models are requested.	
mlModelRateReq	array(string)	O	0..N	Identifying the requirements for the rating of the ML model, for which the TL enablement service is requested.	
NOTE: At least one of these attributes shall be included.					

## 6.9.6.2.3 Type: TIModelSelectAssistResp

**Table 6.9.6.2.3-1: Definition of type TIModelSelectAssistResp**

Attribute name	Data type	P	Cardinality	Description	Applicability
mlModelList	array(MIModel)	M	1..N	Identifying the selected one or more pre-trained ML models, for which the TL enablement service is requested.	

## 6.9.6.2.4 Type: TICriteria

**Table 6.9.6.2.4-1: Definition of type TICriteria**

Attribute name	Data type	P	Cardinality	Description	Applicability
reqFeatures	array(string)	O	0..N	Identifies the required features for a pre-trained model.	
dataReq	array(string)	O	0..N	Identifies the training data requirements.	
tlType	TIType	O	0..1	Identifies the type of transfer learning.	
environment	EnvironmentType	O	0..1	Identifies the environment which is associated with the target ML task.	
access	array(AccessType)	O	0..N	Permissions and restrictions to access the pre-trained model.	

## 6.9.6.2.5 Type: MLModel

**Table 6.9.6.2.5-1: Definition of type MLModel**

Attribute name	Data type	P	Cardinality	Description	Applicability
mlRepositoryId	string	M	1	Identifies the unique repository identity of the ML model.	
mlModelInfo	AimlModelInfo	M	1	Identifies the information on the ML model.	
mlModelRating	Uint32	O	0..1	Identifies the rating of the ML model.	

## 6.9.6.2.6 Type: AccessType

**Table 6.9.6.2.6-1: Definition of type AccessType**

Attribute name	Data type	P	Cardinality	Description	Applicability
modelLicense	string	O	0..1	Identifies the license of the pre-trained ML model.	
dataTrainLicense	string	O	0..1	Identifies the license of the dataset, used to train the pre-trained ML model.	
codeTrainLicense	string	O	0..1	Identifies the license of the code, used to train the pre-trained ML model.	

## 6.9.6.3 Simple data types and enumerations

## 6.9.6.3.1 Introduction

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

## 6.9.6.3.2 Simple data types

The simple data types defined in table 6.9.6.3.2-1 shall be supported.

**Table 6.9.6.3.2-1: Simple data types**

Type Name	Type Definition	Description	Applicability

## 6.9.6.3.3 Enumeration: TIType

The enumeration TIType represents the AIMLE service operation modes. It shall comply with the provisions defined in table 6.9.6.3.3-1.

**Table 6.9.6.3.3-1: Enumeration TIType**

Enumeration value	Description	Applicability
INDUCTIVE	Identifies that the pre-trained ML models are for different task than the target ML task, but the target ML task has labelled data.	
TRANSDUCTIVE	Identifies that the pre-trained ML models and the trained ML model for the target ML task have different data distributions (labelled and unlabelled), however share similarities for the task.	
UNSUPERVISED	Identifies that the pre-trained ML models and the trained ML model for the target ML task have both unlabelled data, however share similarities for the task.	

#### 6.9.6.3.4 Enumeration: EnvironmentType

The enumeration EnvironmentType represents the AIMLE service operation modes. It shall comply with the provisions defined in table 6.9.6.3.4-1.

**Table 6.9.6.3.4-1: Enumeration EnvironmentType**

Enumeration value	Description	Applicability
DOMAIN_SHIFT	Identifies that the data distribution suited for the pre-trained ML models differs from the data distribution suited for the trained ML model for the target ML task.	
SIMULATED_REAL	Identifies that the pre-trained ML models are suited for the simulated data while the target ML task has the real-world data.	
DYNAMIC	Identifies that the suited data distribution for the pre-trained ML models changes over time.	
HETEROGENEOUS	Identifies that the data distribution suited for the pre-trained ML models differs significantly from the data distribution suited for the trained ML model for the target ML task.	
ROBOTICS	Identifies that the pre-trained ML models are suited for the target ML task for robotic platforms.	
SMART	Identifies that the pre-trained ML models are suited for the target ML task for smart platforms.	

#### 6.9.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

#### 6.9.6.5 Binary data

##### 6.9.6.5.1 Binary data types

The binary data types defined in table 6.9.6.5.1-1 shall be supported.

**Table 6.9.6.5.1-1: Binary data types**

Name	Clause defined	Content type

#### 6.9.7 Error handling

##### 6.9.7.1 General

For the Aimles\_UeTLModelSelectionAssistance API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [5]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [5] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [5].

In addition, the requirements in the following clauses are applicable for the Aimles\_UeTLModelSelectionAssistance API.

##### 6.9.7.2 Protocol errors

No specific procedures for the Aimles\_UeTLModelSelectionAssistance API are specified.

##### 6.9.7.3 Application errors

The application errors defined for the Aimles\_UeTLModelSelectionAssistance API are listed in table 6.9.7.3-1.

**Table 6.9.7.3-1: Application errors**

Application Error	HTTP status code	Description

## 6.9.8 Feature negotiation

The optional features in table 6.9.8-1 are defined for the Aimles\_UeTLModelSelectionAssistance API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [5].

**Table 6.9.8-1: Supported Features**

Feature number	Feature Name	Description

## 6.9.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [5] shall apply for the Aimles\_UeTLModelSelectionAssistance API.

## 6.10 Aimlec\_AIMLEClientServiceOperations API

### 6.10.1 Introduction

The AIMLE client service operations service shall use the Aimlec\_AIMLEClientServiceOperations API.

The API URI of the Aimlec\_AIMLEClientServiceOperations API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>**

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [5].
- The <apiName> shall be "aimlec-serv-ops".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 6.10.4.

### 6.10.2 Usage of HTTP and common API related aspects

The provisions of clause 5.2 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_AIMLEClientServiceOperations API.

### 6.10.3 Resources

There are no resources defined for this API in this release of the specification.

## 6.10.4 Custom operations without associated resources

### 6.10.4.1 Overview

**Table 6.10.4.1-1: Custom operations without associated resources**

Operation name	Custom operation URI	Mapped HTTP method	Description
AIMLE service operation request	/perform	POST	Used by the AIMLE server to request the AIMLE client to perform AIMLE service operation.

### 6.10.4.2 Operation: AIMLE service operation request

#### 6.10.4.2.1 Description

The custom operation enables the AIMLE server to request the AIMLE client to perform the AIMLE client service operation.

#### 6.10.4.2.2 Operation definition

This operation shall support the response data structures and response codes specified in tables 6.10.4.2.2-1 and 6.10.4.2.2-2.

**Table 6.10.4.2.2-1: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
AimleClientServOpReq	M	1	Contains the AIMLE client service operation request information.

**Table 6.10.4.2.2-2: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
AimleClientServOpResp	M	1	200 OK	Successful case. The AIMLE client service operation is performed.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.10.4.2.2-3: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

**Table 6.10.4.2.2-4: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

## 6.10.5 Notifications

There are no notifications defined for this API in this release of the specification.

## 6.10.6 Data model

### 6.10.6.1 General

This clause specifies the application data model supported by the Aimlec\_AIMLEClientServiceOperations API.

Table 6.10.6.1-1 specifies the data types defined for the Aimlec\_AIMLEClientServiceOperations API.

**Table 6.10.6.1-1: Aimlec\_AIMLEClientServiceOperations API specific Data Types**

Data type	Clause defined	Description	Applicability
AimleClientServOpReq	6.10.6.2.2	Contains the AIMLE client service operation request information.	
AimleClientServOpResp	6.10.6.2.3	Contains the AIMLE client service operation response information.	
ServiceOperationInfo	6.10.6.2.4	Contains the AI/ML service operation information.	
ServiceOperationMode	6.10.6.3.3	Represents service operation modes.	
ServiceOpModeConfiguration	6.10.6.2.5	Contains the AI/ML service operation mode configuration.	

Table 6.10.6.1-2 specifies data types re-used by the Aimlec\_AIMLEClientServiceOperations API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the Aimlec\_AIMLEClientServiceOperations API.

**Table 6.10.6.1-2: Aimlec\_AIMLEClientServiceOperations API re-used Data Types**

Data type	Reference	Comments	Applicability
DurationSec	3GPP TS 29.122 [5]	Used to indicate a time duration expressed in units of seconds.	
ReportingRequirements	3GPP TS 29.549 [9]	Used to indicate the reporting configuration of the AI/ML service operation status.	
Uint32	3GPP TS 29.571 [11]	Used to indicate the latency.	
Uri	3GPP TS 29.122 [5]	Used to indicate a URI.	

### 6.10.6.2 Structured data types

#### 6.10.6.2.1 Introduction

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

## 6.10.6.2.2 Type: AimleClientServOpReq

Table 6.10.6.2.2-1: Definition of type AimleClientServOpReq

Attribute name	Data type	P	Cardinality	Description	Applicability
aimleServerId	string	M	1	The AIMLE server identifier.	
valServiceId	string	O	0..1	Represents the VAL service identifier.	
servOpId	string	M	1	Contains the AI/ML service operation identifier.	
servOpMode	ServiceOperationMode	M	1	Contains the service operation mode.	
servOpInfo	ServiceOperationInfo	O	0..1	Contains the AI/ML service operation information (e.g. AI/ML service model container, URI of the model to fetch the model from a repository, AI/ML service aggregator URI).	
servOpModeCfg	ServiceOperationModeConfiguration	O	0..1	Contains the AI/ML service operation mode configuration (e.g. network utilization (like stop the AI/ML service when latency is worse than x milliseconds, time limit threshold (like stop the AI/ML service after 24 hours), model performance (like stop the AI/ML service when model accuracy is 99% achieved)).	
servOpModeStatRptg	ReportingRequirements	O	0..1	Indicates the reporting configuration of the AI/ML service operation status.	

## 6.10.6.2.3 Type: AimleClientServOpResp

Table 6.10.6.2.3-1: Definition of type AimleClientServOpResp

Attribute name	Data type	P	Cardinality	Description	Applicability
valServiceId	string	O	0..1	Represents the VAL service identifier.	
servOpId	string	M	1	Contains the AI/ML service operation identifier.	
servOpModeStatus	ServiceOperationMode	M	1	Indicates the service operation mode status.	

## 6.10.6.2.4 Type: ServiceOperationInfo

Table 6.10.6.2.4-1: Definition of type ServiceOperationInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
mIMdlContainer	string	O	0..1	Represents the AI/ML service model container.	
mIMdlUri	Uri	O	0..1	Represents the URI of the ML model to be retrieved from the model repository.	
mIMdAggregUri	Uri	O	0..1	Represents the ML model aggregator URI to send the model updates.	
maxConvTime	DurationSec	O	0..1	Indicates the maximum convergence time used in the AI/ML service operation optimization assistance.	

## 6.10.6.2.5 Type: ServiceOpModeConfiguration

**Table 6.10.6.2.5-1: Definition of type ServiceOpModeConfiguration**

Attribute name	Data type	P	Cardinality	Description	Applicability
maxLatency	Uint32	O	0..1	Indicates the latency threshold value in milliseconds to stop the AI/ML service operation.	
maxDurHour	integer	O	0..1	Indicates the maximum duration time of the AI/ML service operation expressed in hours.	
modelAccuracy	integer	O	0..1	Indicates the threshold value of the model accuracy expressed as a percentage to stop the AI/ML service operation.	

## 6.10.6.3 Simple data types and enumerations

## 6.10.6.3.1 Introduction

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

## 6.10.6.3.2 Simple data types

The simple data types defined in table 6.10.6.3.2-1 shall be supported.

**Table 6.10.6.3.2-1: Simple data types**

Type Name	Type Definition	Description	Applicability

## 6.10.6.3.3 Enumeration: ServiceOperationMode

The enumeration ServiceOperationMode represents the AIMLE service operation modes. It shall comply with the provisions defined in table 6.10.6.3.3-1.

**Table 6.10.6.3.3-1: Enumeration ServiceOperationMode**

Enumeration value	Description	Applicability
START	Indicates a request to start the AIMLE service operation or status of the AIMLE service operation.	
STOP	Indicates a request to stop the AIMLE service operation or status of the AIMLE service operation.	

## 6.10.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

## 6.10.6.5 Binary data

## 6.10.6.5.1 Binary data types

The binary data types defined in table 6.10.6.5.1-1 shall be supported.

**Table 6.10.6.5.1-1: Binary data types**

Name	Clause defined	Content type

## 6.10.7 Error handling

### 6.10.7.1 General

For the Aimlec\_AIMLEClientServiceOperations API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [5]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [5] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [5].

In addition, the requirements in the following clauses are applicable for the Aimlec\_AIMLEClientServiceOperations API.

### 6.10.7.2 Protocol errors

No specific procedures for the Aimlec\_AIMLEClientServiceOperations API are specified.

### 6.10.7.3 Application errors

The application errors defined for the Aimlec\_AIMLEClientServiceOperations API are listed in table 6.10.7.3-1.

**Table 6.10.7.3-1: Application errors**

Application Error	HTTP status code	Description

## 6.10.8 Feature negotiation

The optional features in table 6.10.8-1 are defined for the Aimlec\_AIMLEClientServiceOperations API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [5].

**Table 6.10.8-1: Supported Features**

Feature number	Feature Name	Description

## 6.10.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_AIMLEClientServiceOperations API.

## 6.11 Aimlec\_AimlTaskTransfer API

### 6.11.1 Introduction

The AIMLE client AI/ML task transfer shall use the Aimlec\_AimlTaskTransfer API.

The API URI of the Aimlec\_AimlTaskTransfer API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [5], i.e.:

{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [5].
- The <apiName> shall be "aimlec-task-transfer".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 6.11.4.

## 6.11.2 Usage of HTTP and common API related aspects

The provisions of clause 5.2 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_AimlTaskTransfer API.

## 6.11.3 Resources

There are no resources defined for this API in this release of the specification.

## 6.11.4 Custom operations without associated resources

### 6.11.4.1 Overview

**Table 6.11.4.1-1: Custom operations without associated resources**

Operation name	Custom operation URI	Mapped HTTP method	Description
AI/ML task transfer	/request	POST	Used by the AIMLE server to request the AIMLE client to perform AI/ML task transfer.
Direct AI/ML task transfer	/request-direct	POST	Used by the AIMLE client to request the target AIMLE client to perform AI/ML task transfer.

### 6.11.4.2 Operation: AI/ML task transfer

#### 6.11.4.2.1 Description

The custom operation enables the AIMLE server to request the AIMLE client to perform the AI/ML task transfer operation.

#### 6.11.4.2.2 Operation definition

This operation shall support the response data structures and response codes specified in tables 6.11.4.2.2-1 and 6.11.4.2.2-2.

**Table 6.11.4.2.2-1: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
AimleClientTaskTransfer Req	M	1	Contains the AIMLE client task transfer request information.

**Table 6.11.4.2.2-2: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
AimleClientTaskTransfer Res	M	1	200 OK	Successful case. The AIMLE client AI/ML task transfer is performed.
n/a			204 No Content	Successful case. The AIMLE client AI/ML task transfer is performed and no content is returned in the response body.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.11.4.2.2-3: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

**Table 6.11.4.2.2-4: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

### 6.11.4.3 Operation: Direct AI/ML task transfer

#### 6.11.4.3.1 Description

The custom operation enables the AIMLE client to request an AIMLE client to perform the direct AI/ML task transfer operation.

#### 6.11.4.3.2 Operation definition

This operation shall support the response data structures and response codes specified in tables 6.11.4.3.2-1 and 6.11.4.3.2-2.

**Table 6.11.4.3.2-1: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
AimleClientDirectTransfer Req	M	1	Contains the AIMLE client direct task transfer request information.

**Table 6.11.4.3.2-2: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The AIMLE client direct AI/ML task transfer is performed.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE client. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.11.4.3.2-3: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

**Table 6.11.4.3.2-4: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE client.

## 6.11.5 Notifications

There are no notifications defined for this API in this release of the specification.

## 6.11.6 Data model

### 6.11.6.1 General

This clause specifies the application data model supported by the Aimlec\_AimlTaskTransfer API.

Table 6.11.6.1-1 specifies the data types defined for the Aimlec\_AimlTaskTransfer API.

**Table 6.11.6.1-1: Aimlec\_AimlTaskTransfer API specific Data Types**

Data type	Clause defined	Description	Applicability
AimleClientDirectTransferReq	6.11.6.2.4	Contains the AIMLE client direct task transfer request information.	
AimleClientTaskTransferReq	6.11.6.2.2	Contains the AIMLE client task transfer request information.	
AimleClientTaskTransferRes	6.11.6.2.3	Contains the AIMLE client task transfer response information.	
AimlInfoType	6.11.6.3.3	Represents the AI/ML information type.	

Table 6.11.6.1-2 specifies data types re-used by the Aimlec\_AimlTaskTransfer API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the Aimlec\_AimlTaskTransfer API.

**Table 6.11.6.1-2: Aimlec\_AimlTaskTransfer API re-used Data Types**

Data type	Reference	Comments	Applicability
AimlOperation	6.3.6.3.5	Represents a type of the AI/ML operation (e.g. training, model transfer, model inference, model offload, model split, continue performing intermediate AI/ML operation).	
TimeWindow	3GPP TS 29.122 [5]	Represents a time window.	
ValTargetUe	3GPP TS 29.549 [9]	Unique identifier of a VAL user or a VAL UE.	

## 6.11.6.2 Structured data types

### 6.11.6.2.1 Introduction

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

### 6.11.6.2.2 Type: AimleClientTaskTransferReq

**Table 6.11.6.2.2-1: Definition of type AimleClientTaskTransferReq**

Attribute name	Data type	P	Cardinality	Description	Applicability
requestorId	string	M	1	Contains the identifier of the service consumer. For the AIMLE client, e.g. unique client identifier. For the AIMLE server, e.g. FQDN, URI.	
sourceAimlId	ValTargetUe	M	1	The identifier of the VAL UE i.e. the source AIMLE client.	
aimlTaskType	AimlOperation	M	1	The type of the AI/ML operation (e.g. ML model training).	
aimlInfoType	AimlInfoType	M	1	The type of the AI/ML information in the AI/ML task need be transferred (e.g. intermediate AI/ML operation status, intermediate AI/ML operation results).	
aimlTaskTransferTime	TimeWindow	O	0..1	Information on the requested time or time window for the AI/ML task transfer.	
timeValidity	TimeWindow	O	0..1	The time validity of the AI/ML task transfer request.	

### 6.11.6.2.3 Type: AimleClientTaskTransferRes

**Table 6.11.6.2.3-1: Definition of type AimleClientTaskTransferRes**

Attribute name	Data type	P	Cardinality	Description	Applicability
aimlTaskTransferTime	TimeWindow	M	1	Information on the time or time window for the AI/ML task transfer.	

## 6.11.6.2.4 Type: AimleClientDirectTransferReq

**Table 6.11.6.2.4-1: Definition of type AimleClientDirectTransferReq**

Attribute name	Data type	P	Cardinality	Description	Applicability
requestorId	ValTargetUe	M	1	The identifier of the VAL UE i.e. the source AIMLE client.	
aimlTaskType	AimlOperation	M	1	The type of the AI/ML operation (e.g. ML model training).	
aimlInfoType	AimlInfoType	M	1	The type of the AI/ML information in the AI/ML task need be transferred (e.g. intermediate AI/ML operation status, intermediate AI/ML operation results).	
aimlTaskTransferTime	TimeWindow	O	0..1	Information on time or time window for the AI/ML task transfer.	
timeValidity	TimeWindow	O	0..1	The time validity of the request.	

## 6.11.6.3 Simple data types and enumerations

## 6.11.6.3.1 Introduction

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

## 6.11.6.3.2 Simple data types

The simple data types defined in table 6.11.6.3.2-1 shall be supported.

**Table 6.11.6.3.2-1: Simple data types**

Type Name	Type Definition	Description	Applicability

## 6.11.6.3.3 Enumeration: AimlInfoType

The enumeration AimlInfoType represents the type of the AI/ML information. It shall comply with the provisions defined in table 6.11.6.3.3-1.

**Table 6.11.6.3.3-1: Enumeration AimlInfoType**

Enumeration value	Description	Applicability
INTERMEDIATE_AIML_OP_RESULTS	Indicates the intermediate AI/ML operation results type of the AI/ML information.	
INTERMEDIATE_AIML_OP_STATUS	Indicates the intermediate AI/ML operation status type of the AI/ML information.	
FIRST_MATCH	Indicates other types of the AI/ML information.	

## 6.11.6.4 Data types describing alternative data types or combinations of data types

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

## 6.11.6.5 Binary data

## 6.11.6.5.1 Binary data types

The binary data types defined in table 6.11.6.5.1-1 shall be supported.

**Table 6.11.6.5.1-1: Binary data types**

Name	Clause defined	Content type

## 6.11.7 Error handling

### 6.11.7.1 General

For the Aimlec\_AimlTaskTransfer API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [5]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [5] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [5].

In addition, the requirements in the following clauses are applicable for the Aimlec\_AimlTaskTransfer API.

### 6.11.7.2 Protocol errors

No specific procedures for the Aimlec\_AimlTaskTransfer API are specified.

### 6.11.7.3 Application errors

The application errors defined for the Aimlec\_AimlTaskTransfer API are listed in table 6.11.7.3-1.

**Table 6.11.7.3-1: Application errors**

Application Error	HTTP status code	Description

## 6.11.8 Feature negotiation

The optional features in table 6.11.8-1 are defined for the Aimlec\_AimlTaskTransfer API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [5].

**Table 6.11.8-1: Supported Features**

Feature number	Feature Name	Description

## 6.11.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [5] shall apply for the Aimlec\_AimlTaskTransfer API.

## 6.12 Aimles\_AIMLTaskTransfer API

### 6.12.1 Introduction

The AIMLE server AI/ML Task Transfer shall use the Aimles\_AIMLTaskTransfer API.

The API URI of the Aimles\_AIMLTaskTransfer API shall be:

**{apiRoot}/<apiName>/<apiVersion>**

The request URIs used in HTTP requests shall have the Resource URI structure defined in clause 5.2.4 of 3GPP TS 29.122 [5], i.e.:

**{apiRoot}/<apiName>/<apiVersion>/<apiSpecificSuffixes>**

with the following components:

- The {apiRoot} shall be set as described in clause 5.2.4 of 3GPP TS 29.122 [5].
- The <apiName> shall be "aimles-task-transfer".
- The <apiVersion> shall be "v1".
- The <apiSpecificSuffixes> shall be set as described in clause 6.12.4.

## 6.12.2 Usage of HTTP and common API related aspects

The provisions of clause 5.2 of 3GPP TS 29.122 [5] shall apply for the Aimles\_AIMLTaskTransfer API.

## 6.12.3 Resources

There are no resources defined for this API in this release of the specification.

## 6.12.4 Custom operations without associated resources

### 6.12.4.1 Overview

**Table 6.12.4.1-1: Custom operations without associated resources**

Operation name	Custom operation URI	Mapped HTTP method	Description
AI/ML task transfer assist	/assist-tt	POST	Used by the AIMLE client to request the AIMLE server to perform task transfer assist.
Controlled AI/ML task transfer	/request-ctld	POST	Used by the AIMLE client to request the AIMLE server to perform AIMLE server controlled task transfer.

### 6.12.4.2 Operation: AI/ML task transfer assist

#### 6.12.4.2.1 Description

The custom operation enables the AIMLE client to request the AIMLE server to perform the AI/ML task transfer assist operation.

#### 6.12.4.2.2 Operation definition

This operation shall support the response data structures and response codes specified in tables 6.12.4.2.2-1 and 6.12.4.2.2-2.

**Table 6.12.4.2.2-1: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
AimlesTaskTransferAssistReq	M	1	Contains the AIMLE server task transfer assist request information.

**Table 6.12.4.2.2-2: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
AimlesTaskTransferAssist Resp	M	1	200 OK	Successful case. The AIMLE server AI/ML task transfer assist is performed.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.12.4.2.2-3: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

**Table 6.12.4.2.2-4: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

### 6.12.4.3 Operation: Controlled AI/ML task transfer

#### 6.12.4.3.1 Description

The custom operation enables the AIMLE client to request an AIMLE server to perform the AIMLE server controlled task transfer operation.

#### 6.12.4.3.2 Operation definition

This operation shall support the response data structures and response codes specified in tables 6.12.4.3.2-1 and 6.12.4.3.2-2.

**Table 6.12.4.3.2-1: Data structures supported by the POST Request Body on this resource**

Data type	P	Cardinality	Description
AimlesControlledTaskTransfer Req	M	1	Contains the AIMLE server controlled task transfer request information.

**Table 6.12.4.3.2-2: Data structures supported by the POST Response Body on this resource**

Data type	P	Cardinality	Response codes	Description
AimlesControlledTaskTransferResp	M	1	200 OK	Successful case. The AIMLE server controlled AI/ML task transfer is performed.
n/a			307 Temporary Redirect	Temporary redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
n/a			308 Permanent Redirect	Permanent redirection. The response shall include a Location header field containing an alternative URI of the resource located in an alternative AIMLE server. Redirection handling is described in clause 5.2.10 of 3GPP TS 29.122 [5].
NOTE: The mandatory HTTP error status codes for the HTTP POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [5] also apply.				

**Table 6.12.4.3.2-3: Headers supported by the 307 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

**Table 6.12.4.3.2-4: Headers supported by the 308 Response Code on this resource**

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative target URI located in an alternative AIMLE server.

## 6.12.5 Notifications

There are no notifications defined for this API in this release of the specification.

## 6.12.6 Data model

### 6.12.6.1 General

This clause specifies the application data model supported by the Aimles\_AIMLTaskTransfer API.

Table 6.12.6.1-1 specifies the data types defined for the Aimles\_AIMLTaskTransfer API.

**Table 6.12.6.1-1: Aimles\_AIMLTaskTransfer API specific Data Types**

Data type	Clause defined	Description	Applicability
AimlesControlledTaskTransferReq	6.12.6.2.4	Contains the AIMLE server controlled task transfer request information.	
AimlesControlledTaskTransferResp	6.12.6.2.5	Contains the AIMLE server controlled task transfer response information.	
AimlesTaskTransferAssistReq	6.12.6.2.2	Contains the AIMLE server task transfer assist request information.	
AimlesTaskTransferAssistResp	6.12.6.2.3	Contains the AIMLE server task transfer assist response information.	
AimlIntermediateInfo	6.12.6.2.7	Contains the AI/ML intermediate information for intermediate AI/ML operation.	
AimlRmngTrainingReq	6.12.6.2.6	Contains requirements for AI/ML model training.	
TransferMode	6.12.3.3.3	Represents the transfer mode.	

Table 6.12.6.1-2 specifies data types re-used by the Aimles\_AIMLTaskTransfer API from other specifications, including a reference to their respective specifications, and when needed, a short description of their use within the Aimles\_AIMLTaskTransfer API.

**Table 6.12.6.1-2: Aimles\_AIMLTaskTransfer API re-used Data Types**

Data type	Reference	Comments	Applicability
AimlInfoType	6.11.6.3.3	Represents the AI/ML information type.	
AimlOperation	6.3.6.3.5	Represents a type of the AI/ML operation (e.g. training, model transfer, model inference, model offload, model split, continue performing intermediate AI/ML operation).	
TimeWindow	3GPP TS 29.122 [5]	Represents a time window.	
ValTargetUe	3GPP TS 29.549 [9]	Unique identifier of a VAL user or a VAL UE.	

## 6.12.6.2 Structured data types

### 6.12.6.2.1 Introduction

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

### 6.12.6.2.2 Type: AimlesTaskTransferAssistReq

**Table 6.12.6.2.2-1: Definition of type AimlesTaskTransferAssistReq**

Attribute name	Data type	P	Cardinality	Description	Applicability
requestorId	ValTargetUe	M	1	The identifier of source AIMLE client.	
valServiceId	string	O	0..1	The identifier of the VAL service for which the assistance information is requested.	
aimlTaskType	AimlOperation	M	1	The type of the AI/ML operation (e.g. ML model training).	
aimlInfoType	AimlInfoType	M	1	The type of the AI/ML information in the AI/ML task need be transferred (e.g. intermediate AI/ML operation status, intermediate AI/ML operation results).	
aimlRmngTrainReq	AimlRmngTrainReq	C	0..1	Contains requirements for AI/ML model training including, required remaining training resource, required remaining training number of iterations. (NOTE)	
aimlmdlInfo	AimlIntermediateInfo	C	0..1	Contains the AI/ML intermediate information for intermediate AI/ML operation, including AI/ML intermediate model, AI/ML intermediate model used training time, used training resource, used training number of iterations. (NOTE)	
timeValidity	TimeWindow	O	0..1	The time validity of the request.	
NOTE: This attribute may be present only if the aimlTaskType attribute is set to value "MODEL_TRAINING".					

### 6.12.6.2.3 Type: AimlesTaskTransferAssistResp

**Table 6.12.6.2.3-1: Definition of type AimlesTaskTransferAssistResp**

Attribute name	Data type	P	Cardinality	Description	Applicability
assistanceTime	TimeWindow	M	1	Indicates a time window for assistance in the AI/ML task transfer.	
targetAimlIds	array(ValTargetUe)	M	1..N	List of the target AIMLE clients.	
transferMode	TransferMode	O	0..1	Indication of the transfer mode (e.g. direct transfer).	

## 6.12.6.2.4 Type: AimlesControlledTaskTransferReq

**Table 6.12.6.2.4-1: Definition of type AimlesControlledTaskTransferReq**

Attribute name	Data type	P	Cardinality	Description	Applicability
requestorId	ValTargetUe	M	1	The identifier of the source AIMLE client.	
aimlTaskType	AimlOperation	M	1	The type of the AI/ML operation (e.g. ML model training).	
aimlInfoType	AimlInfoType	M	1	The type of the AI/ML information in the AI/ML task need be transferred (e.g. intermediate AI/ML operation status, intermediate AI/ML operation results).	
aimlTaskTransferTime	TimeWindow	M	1	Information on time or time window for the AI/ML task transfer.	
timeValidity	TimeWindow	O	0..1	The time validity of the request.	

## 6.12.6.2.5 Type: AimlesControlledTaskTransferResp

**Table 6.12.6.2.5-1: Definition of type AimlesControlledTaskTransferResp**

Attribute name	Data type	P	Cardinality	Description	Applicability
assistanceTime	TimeWindow	M	1	Indicates a time window for assistance in the AI/ML task transfer.	

## 6.12.6.2.6 Type: AimlRmngTrainingReq

**Table 6.12.6.2.6-1: Definition of type AimlRmngTrainingReq**

Attribute name	Data type	P	Cardinality	Description	Applicability
reqRmngTrainResorce	string	O	0..1	Indicates required remaining training resource.	
reqRmngTrainIterNum	integer	O	0..1	Indicates required remaining training number of iterations.	

## 6.12.6.2.7 Type: AimlIntermediateInfo

**Table 6.12.6.2.7-1: Definition of type AimlIntermediateInfo**

Attribute name	Data type	P	Cardinality	Description	Applicability
aimlmdModel	AimlRmngTrainingReq	O	0..1	Indicates the AI/ML intermediate model.	
aimlUsedTrainTime	TimeWindow	O	0..1	Indicates the AI/ML intermediate model used training time.	
usedTrainResource	string	O	0..1	Indicates used training resource.	
usedTrainIterNum	integer	O	0..1	Indicates used training number of iterations.	

## 6.12.6.3 Simple data types and enumerations

## 6.12.6.3.1 Introduction

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

## 6.12.6.3.2 Simple data types

The simple data types defined in table 6.12.6.3.2-1 shall be supported.

**Table 6.12.6.3.2-1: Simple data types**

Type Name	Type Definition	Description	Applicability

**6.12.6.3.3 Enumeration: TransferMode**

The enumeration TransferMode represents the mode of transfer. It shall comply with the provisions defined in table 6.12.6.3.3-1.

**Table 6.12.6.3.3-1: Enumeration TransferMode**

Enumeration value	Description	Applicability
DIRECT	Directly from the source AI/ML member to the target AI/ML member.	
SERVER_CONTROLLED	Transfer with AIMLE server controlled.	

**6.12.6.4 Data types describing alternative data types or combinations of data types**

There are no data types describing alternative data types or combinations of data types defined for this API in this release of the specification.

**6.12.6.5 Binary data**

**6.12.6.5.1 Binary data types**

The binary data types defined in table 6.12.6.5.1-1 shall be supported.

**Table 6.12.6.5.1-1: Binary data types**

Name	Clause defined	Content type

**6.12.7 Error handling**

**6.12.7.1 General**

For the Aimles\_AIMLTaskTransfer API, HTTP error responses shall be supported as specified in clause 5.2.6 of 3GPP TS 29.122 [5]. Protocol errors and application errors specified in clause 5.2.6 of 3GPP TS 29.122 [5] shall be supported for the HTTP status codes specified in table 5.2.6-1 of 3GPP TS 29.122 [5].

In addition, the requirements in the following clauses are applicable for the Aimles\_AIMLTaskTransfer API.

**6.12.7.2 Protocol errors**

No specific procedures for the Aimles\_AIMLTaskTransfer API are specified.

**6.12.7.3 Application errors**

The application errors defined for the Aimles\_AIMLTaskTransfer API are listed in table 6.12.7.3-1.

**Table 6.12.7.3-1: Application errors**

Application Error	HTTP status code	Description

## 6.12.8 Feature negotiation

The optional features in table 6.12.8-1 are defined for the Aimles\_AIMLTaskTransfer API. They shall be negotiated using the extensibility mechanism defined in clause 5.2.7 of 3GPP TS 29.122 [5].

**Table 6.12.8-1: Supported Features**

Feature number	Feature Name	Description

## 6.12.9 Security

The provisions of clause 6 of 3GPP TS 29.122 [5] shall apply for the Aimles\_AIMLTaskTransfer API.

## 6.13 Aimles\_MLModelRetrieval API

See 3GPP TS 29.482 [7].

## 6.14 Aimles\_MLModelUpdate API

See 3GPP TS 29.482 [7].

---

# 7 Using common API framework

## 7.1 General

When CAPIF is used with a AIMLE server service, the AIMLE server shall support the following functionalities as defined in 3GPP TS 29.222 [6]:

- the API exposing function and the related APIs over CAPIF-2/2e and CAPIF-3/3e reference points;
- the API publishing function and the related APIs over CAPIF-4/4e reference point;
- the API management function and the related APIs over CAPIF-5/5e reference point; and
- at least one of the security methods for authentication and authorization, and the related security mechanisms.

In a centralized deployment as defined in 3GPP TS 23.222 [3], where the CAPIF core function and the API provider domain functions are co-located, the interactions between the CAPIF core function and the API provider domain functions may be independent of the CAPIF-3/3e, CAPIF-4/4e and CAPIF-5/5e reference points.

When CAPIF is used with a AIMLE server service, the AIMLE server shall register all the northbound APIs features in the CAPIF core function.

## 7.2 Security

When CAPIF is used for external exposure, before invoking an API exposed by the AIMLE server, the service API consumer (e.g. AIMLE client) acting as an API invoker shall negotiate the security method (PKI, TLS-PSK or OAuth 2.0) with the CAPIF core function and ensure that the AIMLE server has enough credentials to authenticate the service API consumer (e.g. AIMLE client), as defined in clauses 5.6.2.2 and 6.2.2.2 of 3GPP TS 29.222 [6].

If PKI or TLS-PSK is selected as the security method to be used between the service API consumer (e.g. AIMLE client) and the AIMLE server, upon API invocation, the AIMLE server shall retrieve the authorization information from the CAPIF core function as described in clause 5.6.2.4 of 3GPP TS 29.222 [6].

As indicated in 3GPP TS 33.122 [12], the access to the AIMLE server APIs may be authorized by means of the OAuth 2.0 protocol (see IETF RFC 6749 [13]), using the "Client Credentials" authorization grant, where the CAPIF core function (see 3GPP TS 29.222 [6]) plays the role of the authorization server.

NOTE 1: In this release, only "Client Credentials" authorization grant is supported.

If OAuth 2.0 is selected as the security method to be used between the service API consumer (e.g. AIMLE client) and the AIMLE server, the service API consumer (e.g. AIMLE client) shall, prior to consuming the services offered by the AIMLE server APIs, obtain a "token" from the authorization server, by invoking the Obtain\_Authorization service operation as described in clause 5.6.2.3.2 of 3GPP TS 29.222 [6].

The AIMLE server APIs do not define any scopes for OAuth 2.0 authorization. It is the AIMLE server responsibility to check whether the service API consumer (e.g. AIMLE client) is authorized to use an API based on the provided "token". Once the AIMLE server verifies the "token", it shall check whether the AIMLE server identifier in the "token" matches its own published identifier, and whether the API name in the "token" matches its own published API name. If those checks are passed, the service API consumer (e.g. AIMLE client) has full authority to access any resource or operation provided by the invoked API.

NOTE 2: For the aforementioned security methods, the AIMLE server needs to apply admission control according to access control policies after performing the authorization checks.

# Annex A (normative): OpenAPI specification

## A.1 General

This annex specifies the formal definition of the API(s) defined in the present specification. It consists of OpenAPI specifications in YAML format, see OpenAPI [14].

This annex takes precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API(s).

NOTE 1: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification files contained in this 3GPP Technical Specification are available on a Git-based repository that uses the GitLab software version control system (see clause 5.3.1 of 3GPP TS 29.501 [8] and clause 5B of 3GPP TR 21.900 [1]).

## A.2 Aimlec\_AIMLEClientParticipation API

openapi: 3.0.0

info:

```
title: Aimlec_AIMLEClientParticipation
version: 1.0.2
description: |
  API for Client Participation Service.
  © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.
```

externalDocs:

```
description: >
  3GPP TS 24.560 V19.1.0; Artificial Intelligence / Machine Learning (AIML) Services – Service
  Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3.
url: 'https://www.3gpp.org/ftp/Specs/archive/24_series/24.560/'
```

servers:

```
- url: '{apiRoot}/aimlec-cp/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122.
```

security:

```
- {}
- oAuth2ClientCredentials: []
```

paths:

```
/participation:
  post:
    summary: >
      Used by AIMLE server to manage the participation of AIMLE clients in AI/ML operations.
    operationId: ClientParticipation
    tags:
      - AIMLE client for participation of the AI/ML operations request (Collection)
    requestBody:
      description: Contains information of the AIMLE client participates the AI/ML operations.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AimlecParticipationReq'
    responses:
      '200':
        description: Contains the outcome of the successful AIMLE client participation.
        content:
```

```

    application/json:
      schema:
        $ref: '#/components/schemas/AimlecParticipationResp'
  '307':
    $ref: 'TS29122_CommonData.yaml#/components/responses/307'
  '308':
    $ref: 'TS29122_CommonData.yaml#/components/responses/308'
  '400':
    $ref: 'TS29122_CommonData.yaml#/components/responses/400'
  '401':
    $ref: 'TS29122_CommonData.yaml#/components/responses/401'
  '403':
    $ref: 'TS29122_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29122_CommonData.yaml#/components/responses/404'
  '411':
    $ref: 'TS29122_CommonData.yaml#/components/responses/411'
  '413':
    $ref: 'TS29122_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29122_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29122_CommonData.yaml#/components/responses/default'

```

components:

```

securitySchemes:
  oAuth2ClientCredentials:
    type: oauth2
    flows:
      clientCredentials:
        tokenUrl: '{tokenUrl}'
        scopes: {}

```

schemas:

# Structured data types

```

AimlecParticipationReq:
  description: Represents the participation request for the AI/ML operations.
  type: object
  required:
  - requesterId
  - clientSetId
  - clientSetPart
  - mlModelId
  - schedAimlOperations
  - dataSetReq
  - serviceReq
  properties:
    requesterId:
      description: Represents the requester identity.
      type: string
    clientSetId:
      description: Represents the AIMLE client set identity.
      type: string
    clientSetPart:
      $ref: '#/components/schemas/ClientSetPart'
    mlModelId:
      description: Identifies the identity of the ML model for AI/ML operation.
      type: string
    schedAimlOperations:
      type: array
      items:
        $ref: '#/components/schemas/SchedAimlOperation'
      minItems: 1
    dataSetReq:
      $ref: 'TS29482_AIMLES_AIMLEClientDiscovery.yaml#/components/schemas/DatasetRequirement'
    serviceReq:
      $ref: 'TS29482_AIMLES_AIMLEClientDiscovery.yaml#/components/schemas/ServiceRequirement'

```

AimlecParticipationResp:

```

description: Represents the participation response for the AI/ML operations.
type: object
required:
- clientStatus
properties:
  clientStatus:
    description: true indicates the willingness and false indicates the denial.
    type: boolean

SchedAimlOperation:
description: Represents the scheduled AI/ML participation type.
type: object
required:
- aimlOperation
properties:
  aimlOperation:
    $ref: 'TS24560_Aimles_AIMLEClientRegistration.yaml#/components/schemas/AimlOperation'
  aimlOperSched:
    $ref: 'TS29122_CpProvisioning.yaml#/components/schemas/ScheduledCommunicationTime'

# Enumerations

ClientSetPart:
  anyOf:
    - type: string
      enum:
        - JOIN
        - DEPART
    - type: string
      description: >
        This string provides the participation request for the AIMLE client set.
  description: |
    Identifies the type of request for participating the AIMLE client set.
    Possible values are:
    - JOIN: Request to join the AIMLE client set.
    - DEPART: Request to depart from the AIMLE client set.

```

---

## A.3 Aimlec\_HFLTraining API

```

openapi: 3.0.0

info:
  title: Aimlec_HFLTraining
  version: 1.0.2
  description: |
    API for Horizontal Federated Learning (HFL) training Service.
    © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: >
    3GPP TS 24.560 V19.1.0; Artificial Intelligence / Machine Learning (AIML) Services – Service
    Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3.
  url: 'https://www.3gpp.org/ftp/Specs/archive/24_series/24.560/'

servers:
- url: '{apiRoot}/aimlec-hfl-trng/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122.

security:
- {}
- oAuth2ClientCredentials: []

paths:
  /subscriptions:
    post:
      summary: >
        Used by AIMLE server to subscribe with the AIMLE client for HFL training event.
      operationId: HFLTraningSubs
      tags:
        - HFL training service API event subscriptions (Collection)
      requestBody:

```

```

description: Contains information for HFL training subscription.
required: true
content:
  application/json:
    schema:
      $ref: '#/components/schemas/HflTrngSub'
responses:
  '201':
    description: Created. Service API event subscription resource created successfully.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/HflTrngSub'
    headers:
      Location:
        description: Contains the URI of the newly created resource.
        required: true
        schema:
          type: string
  '400':
    $ref: 'TS29122_CommonData.yaml#/components/responses/400'
  '401':
    $ref: 'TS29122_CommonData.yaml#/components/responses/401'
  '403':
    $ref: 'TS29122_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29122_CommonData.yaml#/components/responses/404'
  '411':
    $ref: 'TS29122_CommonData.yaml#/components/responses/411'
  '413':
    $ref: 'TS29122_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29122_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29122_CommonData.yaml#/components/responses/default'
callbacks:
  notifUri:
    '{$request.body#/notifUri}':
      post:
        requestBody: # contents of the callback message
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/HflTrngNotify'
        responses:
          '204':
            description: No Content (successful notification)
          '307':
            $ref: 'TS29122_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29122_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29122_CommonData.yaml#/components/responses/400'
          '411':
            $ref: 'TS29122_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29122_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29122_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29122_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29122_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29122_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29122_CommonData.yaml#/components/responses/default'

/subscriptions/{subscriptionId}:
  parameters:
    - name: subscriptionId

```

```

    in: path
    description: Identifier of the individual Events Subscription.
    required: true
    schema:
      type: string
  get:
    description: Retrieve an existing "Individual HFL training subscription" resource.
    operationId: RetrieveHFLTraningSubs
    tags:
      - Individual HFL training Subscription (Document)
    responses:
      '200':
        description: The individual HFL training subscription.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/HflTrngSub'
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  put:
    description: >
      Update the "Individual HFL training subscription" resource.
    operationId: UpdateHFLTrainingSubs
    tags:
      - Individual HFL training subscription (Document)
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/HflTrngSub'
    responses:
      '200':
        description: >
          OK. Individual HFL training subscription resource is successfully updated,
          and representation of updated resource is returned in the response body.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/HflTrngSub'
      '204':
        description: >
          No Content. Individual HFL training subscription resource is successfully updated,
          and no content is returned in the response body.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':

```

```

    $ref: 'TS29122_CommonData.yaml#/components/responses/411'
  '413':
    $ref: 'TS29122_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29122_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29122_CommonData.yaml#/components/responses/default'

patch:
  description: >
    Modify the "Individual HFL training subscription" resource.
  operationId: ModifyHFLTrainingSubs
  tags:
    - Individual HFL training subscription (Document)
  requestBody:
    required: true
    content:
      application/merge-patch+json:
        schema:
          $ref: '#/components/schemas/HflTrngSubPatch'
  responses:
    '200':
      description: >
        OK. The Individual HFL training subscription resource is successfully modified,
        and representation of the modified resource is returned in the response body.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/HflTrngSub'
    '204':
      description: >
        No Content. The Individual HFL training subscription resource is successfully modified,
        and no content is returned in the response body.
    '307':
      $ref: 'TS29122_CommonData.yaml#/components/responses/307'
    '308':
      $ref: 'TS29122_CommonData.yaml#/components/responses/308'
    '400':
      $ref: 'TS29122_CommonData.yaml#/components/responses/400'
    '401':
      $ref: 'TS29122_CommonData.yaml#/components/responses/401'
    '403':
      $ref: 'TS29122_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29122_CommonData.yaml#/components/responses/404'
    '411':
      $ref: 'TS29122_CommonData.yaml#/components/responses/411'
    '413':
      $ref: 'TS29122_CommonData.yaml#/components/responses/413'
    '415':
      $ref: 'TS29122_CommonData.yaml#/components/responses/415'
    '429':
      $ref: 'TS29122_CommonData.yaml#/components/responses/429'
    '500':
      $ref: 'TS29122_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29122_CommonData.yaml#/components/responses/503'
    default:
      $ref: 'TS29122_CommonData.yaml#/components/responses/default'

delete:
  description: Deletes an individual HFL training subscription.
  operationId: DeleteHFLTraningSubs
  tags:
    - Individual HFL training Subscription (Document)
  responses:
    '204':
      description: >
        The individual HFL training Subscription matching the subscriptionId is deleted.
    '307':
      $ref: 'TS29122_CommonData.yaml#/components/responses/307'
    '308':

```

```

    $ref: 'TS29122_CommonData.yaml#/components/responses/308'
  '400':
    $ref: 'TS29122_CommonData.yaml#/components/responses/400'
  '401':
    $ref: 'TS29122_CommonData.yaml#/components/responses/401'
  '403':
    $ref: 'TS29122_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29122_CommonData.yaml#/components/responses/404'
  '429':
    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29122_CommonData.yaml#/components/responses/default'

```

components:

```

securitySchemes:
  oAuth2ClientCredentials:
    type: oauth2
    flows:
      clientCredentials:
        tokenUrl: '{tokenUrl}'
        scopes: {}

```

schemas:

```

#
# STRUCTURED DATA TYPES
#

```

```

HflTrngSub:
  description: Represents data type for HFL training subscription and its update.
  type: object
  required:
    - requesterId
    - notifUri
    - aimlMdlInfo
    - dataId
    - noDataSamp
    - vaSrvId
  properties:
    requesterId:
      description: Represents the requester identity.
      type: string
    notifUri:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
    aimlMdlInfo:
      $ref: 'TS29482_AIMLES_MLModelTraining.yaml#/components/schemas/MlModelInfo'
    dataId:
      description: Identifies the dataset which is to be used for the HFL training.
      type: string
    noDataSamp:
      description: Identifies the required number of samples for a round of the HFL training.
      type: integer
    operSched:
      $ref: 'TS29122_CpProvisioning.yaml#/components/schemas/ScheduledCommunicationTime'
    notifReqs:
      $ref: 'TS29549_SS_NetworkResourceMonitoring.yaml#/components/schemas/ReportingRequirements'
    suppFeat:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    vaSrvId:
      description: Identifies the VAL service for the AIMLE HFL training operation.
      type: string
    subId:
      description: Identifies the subscription.
      type: string

```

```

HflTrngSubPatch:
  description: Represents data type for partial update of the HFL training subscription.
  type: object
  properties:
    notifUri:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'

```

```

    aimlMdlInfo:
      $ref: 'TS29482_AIMLES_MLModelTraining.yaml#/components/schemas/MlModelInfo'
    dataId:
      description: Identifies the dataset which is to be used for the HFL training.
      type: string
    noDataSamp:
      description: Identifies the required number of samples for a round of the HFL training.
      type: integer
    operSched:
      $ref: 'TS29122_CpProvisioning.yaml#/components/schemas/ScheduledCommunicationTime'
    notifReqs:
      $ref:
'TS29549_SS_NetworkResourceMonitoring.yaml#/components/schemas/ReportingRequirements'

    HflTrngNotify:
      description: Represent the information from the HFL training event notification.
      type: object
      required:
      - hflTrngOut
      - vaSrvId
      properties:
        vaSrvId:
          description: Identifies the VAL service for the AIMLE HFL training operation.
          type: string
        hflTrngOut:
          $ref: 'TS29482_AIMLES_MLModelTraining.yaml#/components/schemas/PerfParams'
        hflTrngErr:
          $ref: 'TS29482_AIMLES_MLModelTraining.yaml#/components/schemas/TrainingErr'
        timestamp:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'

```

---

## A.4 Aimles\_AIMLEClientRegistration API

openapi: 3.0.0

info:

```

title: Aimles_AIMLEClientRegistration
version: 1.0.2
description: |
  API for AIMLE Client Registration Service.
  © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.

```

externalDocs:

```

description: >
  3GPP TS 24.560 V19.1.0; Artificial Intelligence / Machine Learning (AIML) Services – Service
  Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3.
url: 'https://www.3gpp.org/ftp/Specs/archive/24_series/24.560/'

```

servers:

```

- url: '{apiRoot}/aimles-client-reg/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122.

```

security:

```

- {}
- oAuth2ClientCredentials: []

```

paths:

```

/registrations:
  post:
    summary: Registers the AIMLE client at the AIMLE server.
    operationId: RegAimleClient
    tags:
      - AIMLE client registrations (Collection)
    requestBody:
      description: >
        Contains information for the creation of a new individual AIMLE client registration
        resource.
      required: true
      content:
        application/json:
          schema:

```

```

        $ref: '#/components/schemas/AimleClientRegInfo'
responses:
  '201':
    description: Represents an individual AIMLE client registration resource.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/AimleRegistration'
    headers:
      Location:
        description: >
          Contains the URI of the newly created individual AIMLE client registration
          resource.
        required: true
        schema:
          type: string
  '400':
    $ref: 'TS29122_CommonData.yaml#/components/responses/400'
  '401':
    $ref: 'TS29122_CommonData.yaml#/components/responses/401'
  '403':
    $ref: 'TS29122_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29122_CommonData.yaml#/components/responses/404'
  '411':
    $ref: 'TS29122_CommonData.yaml#/components/responses/411'
  '413':
    $ref: 'TS29122_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29122_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29122_CommonData.yaml#/components/responses/default'

/registrations/{registrationId}:
  put:
    summary: Update an Individual AIMLE client registration resource.
    operationId: UpdateAimleClientReg
    tags:
      - Individual AIMLE client registration (Document)
    parameters:
      - name: registrationId
        description: >
          String identifying the individual AIMLE client registration resource at the AIMLE server.
        in: path
        required: true
        schema:
          type: string
    requestBody:
      description: >
        Contains information for the update of individual AIMLE client registration resource.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AimleRegistration'
    responses:
      '200':
        description: >
          An individual AIMLE client registration resource is updated, and a representation of
          that resource is returned.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AimleRegistration'
      '204':
        description: No Content. An individual AIMLE client registration resource is updated.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'

```

```

'401':
  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
'403':
  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
'404':
  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
'411':
  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
'413':
  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
'415':
  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
'429':
  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
'500':
  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29122_CommonData.yaml#/components/responses/default'

```

delete:

summary: Removes an Individual AIMLE client registration resource.  
 operationId: DelAimleClientReg

tags:

- Individual AIMLE client registration (Document)

parameters:

- name: registrationId

description: >

String identifying the individual AIMLE client registration resource at the AIMLE server.

in: path

required: true

schema:

type: string

responses:

'204':

description: An individual AIMLE client registration resource is removed.

'307':

\$ref: 'TS29122\_CommonData.yaml#/components/responses/307'

'308':

\$ref: 'TS29122\_CommonData.yaml#/components/responses/308'

'400':

\$ref: 'TS29122\_CommonData.yaml#/components/responses/400'

'401':

\$ref: 'TS29122\_CommonData.yaml#/components/responses/401'

'403':

\$ref: 'TS29122\_CommonData.yaml#/components/responses/403'

'404':

\$ref: 'TS29122\_CommonData.yaml#/components/responses/404'

'429':

\$ref: 'TS29122\_CommonData.yaml#/components/responses/429'

'500':

\$ref: 'TS29122\_CommonData.yaml#/components/responses/500'

'503':

\$ref: 'TS29122\_CommonData.yaml#/components/responses/503'

default:

\$ref: 'TS29122\_CommonData.yaml#/components/responses/default'

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{tokenUrl}'

scopes: {}

schemas:

# Structured data types

AimleRegistration:

description: Represents an individual AIMLE client registration resource.

type: object

required:

- regData

properties:

```

    regData:
      $ref: '#/components/schemas/AimleClientRegInfo'
    expTime:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'

AimleClientRegInfo:
  description: Contains the AIMLE client registration information.
  type: object
  required:
  - aimleClientId
  - suppProfiles
  properties:
    aimleClientId:
      $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
    suppProfiles:
      description: Contains a list of supported service information and AIMLE client profiles.
      type: array
      items:
        $ref: '#/components/schemas/SupportedProfile'
      minItems: 1
    suppFeat:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'

SupportedProfile:
  description: Contains AIMLE client profiles and supported service information.
  type: object
  properties:
    clientProfile:
      $ref: '#/components/schemas/AimleClientProfile'
    suppServices:
      description: >
        Contains the list of VAL services identifiers with corresponding service permissions.
      type: array
      items:
        $ref: '#/components/schemas/ServiceData'
      minItems: 1

ServiceData:
  description: Contains VAL service identifier with the corresponding service permission.
  type: object
  required:
  - valServiceId
  properties:
    valServiceId:
      description: Represents the VAL service identifier.
      type: string
    servPermLevel:
      $ref: '#/components/schemas/ServicePermissionLevel'

AimleClientProfile:
  description: >
    Contains the AIMLE client capability information e.g. supported AI/ML model types,
    AI/ML service operation type.
  type: object
  required:
  - aimleClientUri
  - aimlOperations
  - clientCap
  properties:
    aimleClientUri:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
    aimlModelTypes:
      description: Contains AI/ML model types supported by the AIMLE client.
      type: array
      items:
        $ref: '#/components/schemas/AimlModelType'
      minItems: 1
    aimlOperations:
      description: Contains AI/ML operations supported by the AIMLE client.
      type: array
      items:
        $ref: '#/components/schemas/AimlOperation'
      minItems: 1
    clientCap:
      $ref: '#/components/schemas/ClientCapability'
    availTimeSchedCfgs:
      description: >
        Contains the availability schedule of the AIMLE client for the AI/ML service.

```

```

    type: array
    items:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/ScheduledCommunicationTime'
    minItems: 1
  unavblTimeSchedCfgs:
    description: >
      Contains the unavailability schedule of the AIMLE client for the AI/ML service.
    type: array
    items:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/ScheduledCommunicationTime'
    minItems: 1
  availLocCfgs:
    description: >
      Contains the available location-based configurations of the AIMLE client for the
      AI/ML service.
    type: array
    items:
      $ref: '#/components/schemas/LocationConfig'
    minItems: 1
  unavblLocCfgs:
    description: >
      Contains the unavailable location-based configurations of the AIMLE client for the
      AI/ML service.
    type: array
    items:
      $ref: '#/components/schemas/LocationConfig'
    minItems: 1
  dataSetAvail:
    $ref: '#/components/schemas/DataSetAvailability'
  dataCap:
    description: >
      Contains a list of data capabilities such as the type of data that can be collected,
      supported data processing capabilities and supported exploratory data analysis (EAD)
      functions.
    type: array
    items:
      $ref: '#/components/schemas/DataCapability'
    minItems: 1
  taskCaps:
    description: Contains the AI/ML task performing capabilities.
    type: array
    items:
      $ref: '#/components/schemas/TaskCapability'
    minItems: 1

ClientCapability:
  description: Contains the AIMLE client capability information.
  type: object
  required:
  - mlAppType
  - rsrcUsageLvl
  properties:
    mlAppType:
      $ref: '#/components/schemas/MlApplicationType'
    rsrcUsageLvl:
      $ref: '#/components/schemas/ResourceUsageLevel'

DataSetAvailability:
  description: Represents a dataset availability.
  type: object
  required:
  - dataSetIds
  properties:
    dataSetIds:
      description: Contains a list of dataset identifiers.
      type: array
      items:
        type: string
      minItems: 1
    size:
      description: Represents the dataset size e.g., number of entries in dataset.
      type: integer
    age:
      description: Represents the dataset age e.g. data set usage in number of days.
      type: integer
    features:
      description: Contains a list of dataset features.
      type: array

```

```
    items:
      type: string
      minItems: 1

LocationConfig:
  description: >
    Indicates the location-based configurations of the AIMLE client for the AI/ML service.
  type: object
  properties:
    clientLoc:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
    valSvcAreaId:
      $ref: 'TS29549_SS_VALServiceAreaConfiguration.yaml#/components/schemas/ValSvcAreaId'
```

# Simple data types

# Enumerations

```
ServicePermissionLevel:
  anyOf:
  - type: string
  enum:
    - PREMIUM_RESOURCE_USAGE
    - STANDARD_RESOURCE_USAGE
    - LIMITED_RESOURCE_USAGE
    - OTHER_SERVICE_PERMISSION_LEVEL
  - type: string
  description: >
    This string provides forward-compatibility with future extensions to the enumeration
    but is not used to encode content defined in the present version of this API.
  description: |
    Represents a service permission level.
    Possible values are:
    - PREMIUM_RESOURCE_USAGE: Indicates a premium resource usage level.
    - STANDARD_RESOURCE_USAGE: Indicates a standard resource usage level.
    - LIMITED_RESOURCE_USAGE: Indicates a limited resource usage level.
    - OTHER_SERVICE_PERMISSION_LEVEL: Indicates other service permission level.

AimlModelType:
  anyOf:
  - type: string
  enum:
    - DECISION_TREE
    - LINEAR_REGRESSION
    - NEURAL_NETWORK
    - OTHER_MODEL_TYPE
  - type: string
  description: >
    This string provides forward-compatibility with future extensions to the enumeration
    but is not used to encode content defined in the present version of this API.
  description: |
    Represents the AI/ML model types.
    Possible values are:
    - DECISION_TREE: Indicates the decision tree type of the AI/ML model.
    - LINEAR_REGRESSION: Indicates the linear regression type of the AI/ML model.
    - NEURAL_NETWORK: Indicates the neural network type of the AI/ML model.
    - OTHER_MODEL_TYPE: Indicates the other types of the AI/ML model.

AimlOperation:
  anyOf:
  - type: string
  enum:
    - MODEL_INFERENCE
    - MODEL_OFFLOAD
    - MODEL_SPLIT
    - MODEL_TRANSFER
    - MODEL_TRAINING
    - CONTINUE_PERFORM_INTERMEDIATE
  - type: string
  description: >
    This string provides forward-compatibility with future extensions to the enumeration
    but is not used to encode content defined in the present version of this API.
  description: |
    Represents the type of the AI/ML operation.
    Possible values are:
    - MODEL_INFERENCE: Indicates the model inference type of the AI/ML operation.
    - MODEL_OFFLOAD: Indicates the model offload type of the AI/ML operation.
```

- MODEL\_SPLIT: Indicates the model split type of the AI/ML operation.
- MODEL\_TRANSFER: Indicates the model transfer type of the AI/ML operation.
- MODEL\_TRAINING: Indicates the model training type of the AI/ML operation.
- CONTINUE\_PERFORM\_INTERMEDIATE: Indicates the ability to continue performing of the intermediate AI/ML operation.

#### MLApplicationType:

anyOf:

- type: string
- enum:
  - FEDERATED\_LEARNING
  - TRANSFER\_LEARNING
  - SPLIT\_LEARNING
  - OTHER\_ML\_APPLICATION\_TYPE

- type: string

description: >

This string provides forward-compatibility with future extensions to the enumeration but is not used to encode content defined in the present version of this API.

description: |

Represents the ML application types.

Possible values are:

- FEDERATED\_LEARNING: Indicates the federated learning ML application type.
- TRANSFER\_LEARNING: Indicates the transfer learning ML application type.
- SPLIT\_LEARNING: Indicates the split learning ML application type.
- OTHER\_ML\_APPLICATION\_TYPE: Indicates the other ML application types.

#### ResourceUsageLevel:

anyOf:

- type: string
- enum:
  - PREMIUM\_RESOURCE\_USAGE
  - STANDARD\_RESOURCE\_USAGE
  - LIMITED\_RESOURCE\_USAGE

- type: string

description: >

This string provides forward-compatibility with future extensions to the enumeration but is not used to encode content defined in the present version of this API.

description: |

Represents a resource usage level.

Possible values are:

- PREMIUM\_RESOURCE\_USAGE: Indicates a premium resource usage level.
- STANDARD\_RESOURCE\_USAGE: Indicates a standard resource usage level.
- LIMITED\_RESOURCE\_USAGE: Indicates a limited resource usage level.

#### DataCapability:

anyOf:

- type: string
- enum:
  - RAW\_DATA
  - STRUCTURED\_DATA
  - SEMI\_STRUCTURED\_DATA
  - UNSTRUCTURED\_DATA
  - PROCESSED\_DATA
  - EXPLOATORY\_DATA\_ANALYSIS

- type: string

description: >

This string provides forward-compatibility with future extensions to the enumeration but is not used to encode content defined in the present version of this API.

description: |

Represents the data capabilities.

Possible values are:

- RAW\_DATA: Indicates the raw data.
- STRUCTURED\_DATA: Indicates the structured data.
- SEMI\_STRUCTURED\_DATA: Indicates the semi-structured data.
- UNSTRUCTURED\_DATA: Indicates the unstructured data.
- PROCESSED\_DATA: Indicates the processed data.
- EXPLOATORY\_DATA\_ANALYSIS: Indicates the exploratory data analysis function.

match.

#### TaskCapability:

anyOf:

- type: string
- enum:
  - HIGH\_COMPUTE\_CAPABILITY
  - LOW\_COMPUTE\_CAPABILITY
  - LOW\_COSTS\_PERFORMANCE
  - GREEN\_TASK\_PERFORMANCE
  - ENERGY\_EFFICIENT\_PERFORMANCE

```

- type: string
  description: >
    This string provides forward-compatibility with future extensions to the enumeration
    but is not used to encode content defined in the present version of this API.
description: |
  Represents the AI/ML task performing capabilities.
  Possible values are:
  - HIGH_COMPUTE_CAPABILITY: Indicates a high compute capability.
  - LOW_COMPUTE_CAPABILITY: Indicates a low compute capability.
  - LOW_COSTS_PERFORMANCE: Indicates a low cost performance.
  - GREEN_TASK_PERFORMANCE: Indicates a green task performance.
  - ENERGY_EFFICIENT_PERFORMANCE: Indicates an energy efficient performance.

```

---

## A.5 Aimles\_SplitOpPipeline API

openapi: 3.0.0

info:

```

title: Aimles_SplitOpPipeline
version: 1.0.2
description: |
  API for split AI/ML operation pipeline service.
  © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.

```

externalDocs:

```

description: >
  3GPP TS 24.560 V19.1.0; Artificial Intelligence / Machine Learning (AIML) Services - Service
  Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3.
url: 'https://www.3gpp.org/ftp/Specs/archive/24_series/24.560/'

```

servers:

```

- url: '{apiRoot}/aimles-sopl/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122.

```

security:

```

- {}
- oAuth2ClientCredentials: []

```

paths:

```

/request:
  post:
    summary: >
      Used by AIMLE client to create an instance of a split operation pipeline at the AIMLE
      server.
    operationId: SplitOpPipeCreate
    tags:
      - Split operation pipeline creation API (Collection)
    requestBody:
      description: Contains information of the AI/ML split operation pipeline creation.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SplitOpPipelineCreateReq'
    responses:
      '201':
        description: Created. Split operation pipeline creation resource is created successfully.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SplitOpPipelineCreateResp'
        headers:
          Location:
            description: Contains the URI of the newly created resource.
            required: true
            schema:
              type: string
      '400':
        $ref: '#/components/responses/400'
      '401':
        $ref: '#/components/responses/401'

```

```

'403':
  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
'404':
  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
'411':
  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
'413':
  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
'415':
  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
'429':
  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
'500':
  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29122_CommonData.yaml#/components/responses/default'

/request/{requestId}:
  parameters:
    - name: requestId
      in: path
      description: Identifier of the individual AI/ML split operation pipeline.
      required: true
      schema:
        type: string

  put:
    description: >
      Update an individual split operation pipeline resource.
    operationId: SplitOpPipeUpdate
    tags:
      - Individual split operation pipeline (Document)
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SplitOpPipelineCreateReq'
    responses:
      '200':
        description: >
          OK. Individual AIMLE split operation pipeline resource is successfully updated,
          and representation of updated resource is returned in the response body.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SplitOpPipelineCreateResp'
      '204':
        description: >
          No Content. Individual AIMLE split operation pipeline resource is successfully updated,
          and no content is returned in the response body.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
    default:

```

```

    $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  patch:
    description: >
      Modify the "Individual AIMLE split operation pipeline" resource.
    operationId: SplitOpPipeModify
    tags:
      - Individual AIMLE split operation pipeline (Document)
    requestBody:
      required: true
      content:
        application/merge-patch+json:
          schema:
            $ref: '#/components/schemas/SplitOpPipelinePatch'
    responses:
      '200':
        description: >
          OK. The Individual AIMLE split operation pipeline resource is successfully modified,
          and representation of the modified resource is returned in the response body.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SplitOpPipelineCreateResp'
      '204':
        description: >
          No Content. The Individual AIMLE split operation pipeline resource is successfully
          modified, and no content is returned in the response body.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
  delete:
    description: Deletes an individual AIMLE split operation pipeline.
    operationId: SplitOpPipeDelete
    tags:
      - Individual AIMLE split operation pipeline (Document)
    responses:
      '204':
        description: >
          The individual AIMLE split operation pipeline matching the requestId is deleted.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':

```

```

    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29122_CommonData.yaml#/components/responses/default'

/discovery:
  post:
    summary: >
      Used by consumer to request the AIMLE server for split AI/ML operation pipeline discovery
    operationId: SplitOpPipeDiscovery
    tags:
      - AIMLE split operation pipeline discovery
    requestBody:
      description: Contains information of the AIMLE split operation pipeline discovery.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/SplitOpPipelineDiscReq'
    responses:
      '200':
        description: Contains successful outcome of AIMLE split operation pipeline discovery.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/SplitOpPipelineDiscResp'
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:

  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}

  schemas:

#
# STRUCTURED DATA TYPES
#

SplitOpPipelineCreateReq:
  description: Represents AIMLE split operation pipeline create and its update.
  type: object
  required:
    - requestorId
    - notifUri
    - splitOpRequirements
  properties:

```

```
requestorId:
  description: Identifies the service consumer.
  type: string
notifUri:
  $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
splitOpRequirements:
  $ref: '#/components/schemas/SplitOpRequirements'

SplitOpPipelineCreateResp:
  description: Represents response to AIMLE split operation pipeline create and its update.
  type: object
  properties:
    splitOpProfile:
      $ref: 'TS29482_AIMLES_SplitOpEvent.yaml#/components/schemas/SplitOpProfile'

SplitOpPipelinePatch:
  description: Represents AIMLE split operation pipeline update.
  type: object
  required:
  - notifUri
  - splitOpPipelineId
  - splitOpPipelineInfo
  properties:
    notifUri:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
    splitOpPipelineId:
      description: Identifies split operation pipeline.
      type: string
    splitOpPipelineInfo:
      $ref: 'TS29482_AIMLES_SplitOpEvent.yaml#/components/schemas/SplitOpPipelineInfo'

SplitOpPipelineDiscReq:
  description: Represents the AIMLE Split Operation Pipeline Discovery request.
  type: object
  required:
  - notifUri
  - discFilters
  properties:
    notifUri:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
    discFilters:
      $ref: 'TS29482_AIMLES_SplitOpEvent.yaml#/components/schemas/DiscFilters'

SplitOpPipelineDiscResp:
  description: Represents the AIMLE Split Operation Pipeline Discovery response.
  type: object
  properties:
    discoveredNodes:
      type: array
      items:
        type: string
      minItems: 1
    splitOpProfiles:
      type: array
      items:
        $ref: 'TS29482_AIMLES_SplitOpEvent.yaml#/components/schemas/SplitOpProfile'
      minItems: 1
  anyOf:
  - required: [discoveredNodes]
  - required: [splitOpProfiles]

SplitOpRequirements:
  description: Represents the AIMLE Split Operation Pipeline requirements.
  type: object
  required:
  - stageInfo
  properties:
    stageInfo:
      type: array
      items:
        $ref: 'TS29482_AIMLES_SplitOpEvent.yaml#/components/schemas/StageInfo'
      minItems: 1
    usageInfo:
      $ref: 'TS29482_AIMLES_SplitOpNodeRegistration.yaml#/components/schemas/UsageInformation'
    notificationTarget:
      $ref: 'TS29558_Eees_EASRegistration.yaml#/components/schemas/EndPoint'
```

## A.6 Aimlec\_FLGroupIndication API

```

openapi: 3.0.0

info:
  title: Aimlec_FLGroupIndication
  version: 1.0.2
  description: |
    API for AIMLE Client Federated Learning Group Indication Service.
    © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: >
    3GPP TS 24.560 V19.1.0; Artificial Intelligence / Machine Learning (AIML) Services -
    Service enabler Architecture Layer for Verticals (SEAL) Protocol Specification; Stage 3.
  url: http://www.3gpp.org/ftp/Specs/archive/24_series/24.560/

servers:
- url: '{apiRoot}/aimlec-flgi/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122

security:
- {}
- oAuth2ClientCredentials: []

paths:
  /indicate:
    post:
      summary: Indicates FL group information to FL group member
      operationId: IndicateFLMemberInfo
      tags:
        - Indicate FL group
      requestBody:
        description: Contains the FL group member information.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/IndFlMember'
      responses:
        '204':
          description: No Content (Success)
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:

# Structured data types

```

```

securitySchemes:
  oAuth2ClientCredentials:
    type: oauth2
    flows:
      clientCredentials:
        tokenUrl: '{tokenUrl}'
        scopes: {}

schemas:

  IndFlMember:
    description: Indicates the FL member the information on FL member group.
    type: object
    properties:
      serverId:
        type: string
        description: Identifier of the indicating AIMLE server.
      valServiceId:
        type: string
        description: Identifier of the VAL service for which the grouping indication is applied.
      mlModelId:
        type: string
        description: Identifier of the ML model for which the grouping indication is applied.
      analyticsId:
        type: string
        description: >
          Identifier of the ADAE analytics service, the FL grouping is based on, if
          the FL process is used for that ADAE analytics service.
      flGroupIds:
        type: array
        items:
          $ref: '#/components/schemas/FlGroupInfo'
        minItems: 1
        description: >
          List of the AIMLE identifiers of that created or modified FL group for the FL process.
      flGroupDelInfo:
        $ref: '#/components/schemas/FlGroupDeletionInfo'
    required:
      - serverId
      - flGroupIds

  FlGroupInfo:
    description: Represents the FL group information.
    type: object
    required:
      - flGroupId
    properties:
      flGroupId:
        description: Contains the FL group identifier.
        type: string
      flMembers:
        type: array
        items:
          $ref: '#/components/schemas/FlMemberData'
        minItems: 1
        description: Contains FL member data.

  FlMemberData:
    description: >
      Represents the FL group member data e.g. FL member identifier, address. At least one of
      the flMemberId and flMemberAddr shall be present, although they are not specified as a
      conditional due to backward compatibility reasons.
    type: object
    properties:
      flMemberId:
        type: string
        description: Identifier of the FL members
      flMemberAddr:
        $ref: 'TS29549_SS_NetworkResourceAdaptation.yaml#/components/schemas/ValueAddrInfo'
      flMemberInfo:
        $ref: '#/components/schemas/FlMemberInfo'

  FlMemberInfo:
    description: Represents the FL member information e.g. availability, constraint, FL role.
    type: object
    properties:
      availability:
        $ref: '#/components/schemas/FlMemberAvailability'

```

```
constraints:
  description: Represents the FL group member constraints.
  type: array
  items:
    $ref: '#/components/schemas/FlMemberConstraint'
  minItems: 1
  role:
    $ref: '#/components/schemas/FlMemberRole'

FlGroupDeletionInfo:
  description: Indicates the FL group deletion information.
  type: object
  properties:
    cause:
      $ref: '#/components/schemas/FlGroupDelCause'
    expTime:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
```

# Simple data types

# Enumerations

```
FlMemberAvailability:
  anyOf:
  - type: string
    enum:
      - AVAILABLE
      - NOT_AVAILABLE
  - type: string
    description: >
      This string provides forward-compatibility with future extensions to the enumeration
      But is not used to encode content defined in the present version of this API.
  description: |
    Represents the information regarding FL member availability of the VAL UE.
    Possible values are:
    - AVAILABLE: The FL member is available.
    - NOT_AVAILABLE: The FL member is not available.
```

```
FlMemberConstraint:
  anyOf:
  - type: string
    enum:
      - LIMITED_MEMORY
      - LIMITED_PROCESSING
      - LIMITED_ACCESS
  - type: string
    description: >
      This string provides forward-compatibility with future extensions to the enumeration
      But is not used to encode content defined in the present version of this API.
  description: |
    Represents the FL member constraint information of the VAL UE.
    Possible values are:
    - LIMITED_MEMORY: Indicates a limited memory load.
    - LIMITED_PROCESSING: Indicates a limited processing power.
    - LIMITED_ACCESS: Indicates a limited access to only the local data.
```

```
FlMemberRole:
  anyOf:
  - type: string
    enum:
      - FL_CLIENT
      - FL_SERVER
      - FL_AGGREGATOR
  - type: string
    description: >
      This string provides forward-compatibility with future extensions to the enumeration
      But is not used to encode content defined in the present version of this API.
  description: |
    Represents the FL member role of the VAL UE.
    Possible values are:
    - FL_CLIENT: Indicates an FL client role.
    - FL_SERVER: Indicates an FL server role.
    - FL_AGGREGATOR: Indicates an FL aggregator role.
```

```
FlGroupDelCause:
```

```

anyOf:
- type: string
  enum:
    - SRV_TERMINATION
    - OUT_OF_SRV_AREA
- type: string
  description: >
    This string provides information on the FL group deletion cause.
description: |
  Represents the information regarding FL group deletion cause as AI/ML service termination or
  UE has moved out of the service area.
  Possible values are:
  - SRV_TERMINATION: Indicates the AI/ML service termination.
  - OUT_OF_SRV_AREA: Indicates the UE has moved out of the service area.

```

---

## A.7 Aimlec\_ClientDataProcessing API

openapi: 3.0.0

info:

```

title: Aimlec_ClientDataProcessing
version: 1.0.2
description: |
  API for Transfer Learning (TL) Enablement Service.
  © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.

```

externalDocs:

```

description: >
  3GPP TS 24.560 V19.1.0; Artificial Intelligence / Machine Learning (AIML) Services - Service
  Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3.
url: 'https://www.3gpp.org/ftp/Specs/archive/24_series/24.560/'

```

servers:

```

- url: '{apiRoot}/aimlec-data-proc/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122.

```

security:

```

- {}
- oAuth2ClientCredentials: []

```

paths:

```

/trigger:
  post:
    summary: >
      Used by AIMLE server to trigger AIMLE client to request client data processing procedure.
    operationId: ClientDataProcessing
    tags:
      - Client data processing procedure request
    requestBody:
      description: Contains information to trigger client data processing procedure.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/CltdDataProcReq'
    responses:
      '200':
        description: Contains the outcome of the successful client data processing.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/CltdDataProcResp'
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':

```

```

    $ref: 'TS29122_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29122_CommonData.yaml#/components/responses/404'
  '411':
    $ref: 'TS29122_CommonData.yaml#/components/responses/411'
  '413':
    $ref: 'TS29122_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29122_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29122_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29122_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29122_CommonData.yaml#/components/responses/default'

```

components:

```

securitySchemes:
  oAuth2ClientCredentials:
    type: oauth2
    flows:
      clientCredentials:
        tokenUrl: '{tokenUrl}'
        scopes: {}

```

schemas:

# Structured data types

```

ClpDataProcReq:
  description: >
    Contains information to trigger client data processing procedure. At least one of
    dataPrepReqs and dataAnalysisReqs shall be present, although they are not specified as a
    conditional due to backward compatibility reasons.
  type: object
  required:
  - requesterId
  - dataProc
  properties:
    requesterId:
      description: Represents the requester identity.
      type: string
    dataProc:
      $ref: 'TS29482_AIMLES_DataManagement.yaml#/components/schemas/DataMgmtOp'
    dataPrepReqs:
      $ref: 'TS29482_AIMLES_DataManagement.yaml#/components/schemas/DataProcessReqs'
    dataAnalysisReqs:
      $ref: 'TS29482_AIMLES_DataManagement.yaml#/components/schemas/DataProcessReqs'
    dataProcSched:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/ScheduledCommunicationTime'

ClpDataProcResp:
  description: Contains the outcome of the successful client data processing.
  type: object
  properties:
    dataPrepOutputs:
      $ref: 'TS29482_AIMLES_DataManagement.yaml#/components/schemas/AggregatedDataPrepOutputs'
    dataAnalysisOutputs:
      $ref: 'TS29482_AIMLES_DataManagement.yaml#/components/schemas/AggregatedDataAnaOutputs'
    timestamp:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
  anyOf:
  - required: [dataPrepOutputs]
  - required: [dataAnalysisOutputs]

```

---

## A.8 Aimlec\_MLModTngCapEva API

openapi: 3.0.0

```

info:
  title: Aimlec_MLModTngCapEva
  version: 1.0.2

```

```

description: |
  API for ML Model Training Capability Evaluation Service.
  © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.

externalDocs:
  description: >
    3GPP TS 24.560 V19.1.0; Artificial Intelligence / Machine Learning (AIML) Services – Service
    Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3.
  url: 'https://www.3gpp.org/ftp/Specs/archive/24_series/24.560/'

servers:
- url: '{apiRoot}/aimlec-ml-mtce/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122.

security:
- {}
- oAuth2ClientCredentials: []

paths:
  /request:
    post:
      summary: >
        Enables the AIMLE server to request the AIMLE client to perform ML model training
        capability evaluation service operation.
      operationId: MlModTrainCapEvaReq
      tags:
      - ML model training capability evaluation request
      requestBody:
        description: Contains the ML model training capability evaluation request information.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/MlModTngCapEvalReq'
      responses:
        '200':
          description: Contains the ML model training capability evaluation response information.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/MlModTngCapEvalResp'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:

  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:

```

```
    clientCredentials:
      tokenUrl: '{tokenUrl}'
      scopes: {}

schemas:

# Structured data types

MlModTngCapEvalReq:
  description: Contains the ML model training capability evaluation request information.
  type: object
  required:
  - aimleServerId
  properties:
    aimleServerId:
      description: Represents the AIMLE server identifier.
      type: string
    availTime:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
    testTask:
      description: Represents the task for test ML model training capability.
      type: string
    modelInfo:
      $ref: '#/components/schemas/AimlModelData'
    dataSetReq:
      $ref: '#/components/schemas/DataSetRequirements'

MlModTngCapEvalResp:
  description: Contains the ML model training capability evaluation response information.
  type: object
  required:
  - capEvalOut
  properties:
    capEvalOut:
      $ref: '#/components/schemas/CapEvalOutcome'
    testResult:
      description: Represents the test result of the ML model training capability evaluation.
      type: string
    evalFailInd:
      description: Represents the reason for inability to join the FL training process.
      type: string

AimlModelData:
  description: Contains the AI/ML model information and model parameters for use in FL training.
  type: object
  properties:
    aimlModels:
      description: Contains information about the AI/ML model.
      type: array
      items:
        $ref: '#/components/schemas/AimlModelInfo'
      minItems: 1
    mlModelParams:
      description: Contains model parameters for use in FL training.
      type: array
      items:
        type: string
      minItems: 1

DataSetRequirements:
  description: Contains requirements on data set for FL training.
  type: object
  properties:
    commonFtIds:
      description: >
        Contains a list of the features identifiers of the required features common to
        the dataset of the different data domains.
      type: array
      items:
        type: string
      minItems: 1
    domainFts:
      description: >
        Contains a list of features for each data domain(s) of the datasets at the UE.
      type: array
      items:
        $ref: '#/components/schemas/DomainFeatures'
      minItems: 1
```

```

    dataSource:
      description: >
        Represents the identifier of a data source for the FL training (e.g. SEAL server,
        SEAL client, other NF entity, etc.).
      type: string

DomainFeatures:
  description: Contains a list of features for each data domain(s) of the datasets at the UE.
  type: object
  required:
  - domain
  - featureIds
  properties:
    domain:
      description: >
        Represents a data domain i.e. a specific category of data or logical groupings of
        data that all relate together (e.g. customer data, product data, etc.).
      type: string
    featureIds:
      description: >
        Represents a list of the features identifiers for the data domain of the datasets
        at the UE.
      type: array
      items:
        type: string
      minItems: 1

AimlModelInfo:
  description: Contains information about the AI/ML model.
  type: object
  properties:
    aimlModelType:
      $ref: 'TS24560_Aimles_AIMLEClientRegistration.yaml#/components/schemas/AimlModelType'
    mlModelProf:
      $ref: 'TS29482_MLR_MLModelManagement.yaml#/components/schemas/MLModelProfile'

# Simple data types

# Enumerations

CapEvalOutcome:
  anyOf:
  - type: string
  enum:
    - ABILITY_TO_JOIN
    - FIRST_MATCH
  - type: string
  description: >
    This string provides forward-compatibility with future extensions to the enumeration
    but is not used to encode content defined in the present version of this API.
  description: |
    Represents the outcome of the ML model training capability evaluation.
    Possible values are:
    - ABILITY_TO_JOIN: Indicates ability to join the training process.
    - FIRST_MATCH: Indicates inability to join the training process.

```

---

## A.9 Aimles\_UeTLModelSelectionAssistance API

openapi: 3.0.0

info:

```

title: Aimles_UeTLModelSelectionAssistance
version: 1.0.3
description: |
  API for Transfer Learning (TL) Enablement Service.
  © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.

```

externalDocs:

```

description: >
  3GPP TS 24.560 V19.2.0; Artificial Intelligence / Machine Learning (AIML) Services – Service
  Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3.
url: 'https://www.3gpp.org/ftp/Specs/archive/24_series/24.560/'

```

```

servers:
- url: '{apiRoot}/aimles-ue-tl-msa/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122.

security:
- {}
- oAuth2ClientCredentials: []

paths:
/assist-tlms:
  post:
    summary: >
      Used by the AIMLE client to request the AIMLE server to perform TL enablement service.
    operationId: UeTlModSelectAssistReq
    tags:
      - UE transfer learning model selection assistance request
    requestBody:
      description: Contains information to trigger TL enablement service.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/TlModelSelectAssistReq'
    responses:
      '200':
        description: Contains one or more pre-trained ML models for the TL enablement service.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TlModelSelectAssistResp'
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:

  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}

  schemas:

# Structured data types

TlModelSelectAssistReq:
  description: >
    Contains information to trigger TL enablement service. At least one of the mlTaskId,
    adaeAnalyticsId and mlModelProfile shall be present, although they are not specified as

```

```

    a conditional due to backward compatibility reasons.
  type: object
  required:
  - serverId
  - valSrvID
  - tlCriteria
  properties:
    serverId:
      description: Represents the AIMLE server identity.
      type: string
    valSrvID:
      description: Represents the VAL service for the TL enablement service.
      type: string
    tlCriteria:
      $ref: '#/components/schemas/TlCriteria'
    mlTaskId:
      description: Represents the task for the TL enablement service.
      type: string
    adaeAnalyticsId:
      description: Represents the ADAE analytics for the TL enablement service.
      type: string
    mlModelProfile:
      $ref: 'TS29482_MLR_MLModelManagement.yaml#/components/schemas/MLModelProfile'
    mlModelReq:
      description: Represents the requirements for the ML model for the TL enablement service.
      type: array
      items:
        type: string
      minItems: 0
    valUeIds:
      description: Represents VAL UEs associated with the ML task for the TL enablement service.
      type: array
      items:
        $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
      minItems: 0
    mlModelRateReq:
      description: Represents requirements for rating the ML model for TL enablement service.
      type: array
      items:
        type: string
      minItems: 0

TlModelSelectAssistResp:
  description: Contains the pre-trained ML models for the TL enablement service.
  type: object
  required:
  - mlModelList
  properties:
    mlModelList:
      description: Represents the selected pre-trained ML models for the TL enablement service.
      type: array
      items:
        $ref: '#/components/schemas/MlModel'
      minItems: 1

TlCriteria:
  description: Contains the criteria for the TL enablement service.
  type: object
  properties:
    reqFeatures:
      description: Represents the required features for a pre-trained model.
      type: array
      items:
        type: string
      minItems: 0
    dataReq:
      description: Represents the training data requirements.
      type: array
      items:
        type: string
      minItems: 0
    tlType:
      $ref: '#/components/schemas/TlType'
    environment:
      $ref: '#/components/schemas/EnvironmentType'
    access:
      description: Permissions and restrictions to access the pre-trained model.
      type: array

```

```

    items:
      $ref: '#/components/schemas/AccessType'
    minItems: 0

```

```

MLModel:
  description: Contains the pre-trained ML models for the TL enablement service.
  type: object
  required:
    - mlRepositoryId
    - mlModelInfo
  properties:
    mlRepositoryId:
      description: Represents the unique repository identity of an ML model.
      type: string
    mlModelInfo:
      $ref: 'TS24560_Aimlec_MLModTngCapEva.yaml#/components/schemas/AimlModelInfo'
    mlModelRating:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint32'

```

```

AccessType:
  description: Contains permission and restriction to access the pre-trained model.
  type: object
  properties:
    modelLicense:
      description: Represents the license of the pre-trained ML model.
      type: string
    dataTrainLicense:
      description: Represents the license of the dataset for the pre-trained ML model.
      type: string
    codeTrainLicense:
      description: Represents the license of the code for the pre-trained ML model.
      type: string

```

#### # Enumerations

```

TlType:
  anyOf:
    - type: string
      enum:
        - INDUCTIVE
        - TRANSDUCTIVE
        - UNSUPERVISED
    - type: string
      description: >
        This string provides the type of transfer learning.
  description: |
    Identifies how the pre-trained ML models can be related to the trained ML models for
    the target ML task.
    Possible values are:
    - INDUCTIVE: For different task than the target ML task
    - TRANSDUCTIVE: For similar task as target ML task but different data distributions
    - UNSUPERVISED: For similar tasks as target ML task but with unlabelled data

```

```

EnvironmentType:
  anyOf:
    - type: string
      enum:
        - DOMAIN_SHIFT
        - SIMULATED_REAL
        - DYNAMIC
        - HETEROGENEOUS
        - ROBOTICS
        - SMART
    - type: string
      description: >
        This string provides the type of the environment.
  description: |
    Identifies how the environment and data distributions, suited for pre-trained ML models
    in relationship with the trained ML model for the target ML task.
    Possible values are:
    - DOMAIN_SHIFT: Different data distributions
    - SIMULATED_REAL: Simulated data vs. real data
    - DYNAMIC: Data distributions changes over time
    - HETEROGENEOUS: Significantly different data distributions
    - ROBOTICS: Suitable for the target ML task for robotic platforms
    - SMART: Suitable for the target ML task for smart platforms

```

## A.10 Aimlec\_AIMLEClientServiceOperations API

openapi: 3.0.0

info:

```
title: Aimlec_AIMLEClientServiceOperations
version: 1.0.2
description: |
  API for AIMLE Client Service Operations Service.
  © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.
```

externalDocs:

```
description: >
  3GPP TS 24.560 V19.1.0; Artificial Intelligence / Machine Learning (AIML) Services - Service
  Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3.
url: 'https://www.3gpp.org/ftp/Specs/archive/24_series/24.560/'
```

servers:

```
- url: '{apiRoot}/aimlec-serv-ops/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122.
```

security:

```
- {}
- oAuth2ClientCredentials: []
```

paths:

```
/perform:
  post:
    summary: >
      Enables the AIMLE server to request the AIMLE client to perform the AIMLE client
      service operation.
    operationId: AimleServOperReq
    tags:
      - AIMLE service operation request
    requestBody:
      description: Contains the AIMLE client service operation request information.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AimleClientServOpReq'
    responses:
      '200':
        description: Contains the AIMLE client service operation response information.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AimleClientServOpResp'
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
    default:
```

```
$ref: 'TS29122_CommonData.yaml#/components/responses/default'
```

```
components:
```

```
securitySchemes:
  oAuth2ClientCredentials:
    type: oauth2
    flows:
      clientCredentials:
        tokenUrl: '{tokenUrl}'
        scopes: {}
```

```
schemas:
```

```
# Structured data types
```

```
AimleClientServOpReq:
  description: Contains the AIMLE client service operation request information.
  type: object
  required:
  - aimleServerId
  - servOpId
  - servOpMode
  properties:
    aimleServerId:
      description: Represents the AIMLE server identifier.
      type: string
    valServiceId:
      description: Represents the VAL service identifier.
      type: string
    servOpId:
      description: Represents the AI/ML service operation identifier.
      type: string
    servOpMode:
      $ref: '#/components/schemas/ServiceOperationMode'
    servOpInfo:
      $ref: '#/components/schemas/ServiceOperationInfo'
    servOpModeCfg:
      $ref: '#/components/schemas/ServiceOpModeConfiguration'
    servOpModeStatRptg:
      $ref:
```

```
'TS29549_SS_NetworkResourceMonitoring.yaml#/components/schemas/ReportingRequirements'
```

```
AimleClientServOpResp:
  description: Contains the AIMLE client service operation response information.
  type: object
  required:
  - servOpId
  - servOpModeStatus
  properties:
    valServiceId:
      description: Represents the VAL service identifier.
      type: string
    servOpId:
      description: Represents the AI/ML service operation identifier.
      type: string
    servOpModeStatus:
      $ref: '#/components/schemas/ServiceOperationMode'
```

```
ServiceOperationInfo:
  description: Contains the AI/ML service operation information.
  type: object
  properties:
    mlMdlContainer:
      description: Represents the AI/ML service model container.
      type: string
    mlMdlUri:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
    mlMdAggregUri:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/Uri'
    maxConvgTime:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
```

```
ServiceOpModeConfiguration:
  description: Contains the AI/ML service operation mode configuration.
  type: object
  properties:
    maxLatency:
```

```

    $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint32'
  maxDurHour:
    description: >
      Indicates the maximum duration time of the AI/ML service operation expressed in hours.
    type: integer
  modelAccuracy:
    description: >
      Indicates the threshold value of the model accuracy expressed as a percentage to
      stop the AI/ML service operation.
    type: integer

```

# Simple data types

# Enumerations

```

ServiceOperationMode:
  anyOf:
    - type: string
      enum:
        - START
        - STOP
    - type: string
      description: >
        This string provides forward-compatibility with future extensions to the enumeration
        But is not used to encode content defined in the present version of this API.
  description: |
    Represents the AIMLE service operation modes.
    Possible values are:
    - START: Indicates a request to start the AIMLE service operation or status of the AIMLE
    service operation.
    - STOP: Indicates a request to stop the AIMLE service operation or status of the AIMLE
    service operation.

```

---

## A.11 Aimlec\_AimlTaskTransfer API

openapi: 3.0.0

info:

```

  title: Aimlec_AimlTaskTransfer
  version: 1.0.2
  description: |
    API for AIMLE Client AI/ML Task Transfer Service.
    © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

```

externalDocs:

```

  description: >
    3GPP TS 24.560 V19.1.0; Artificial Intelligence / Machine Learning (AIML) Services - Service
    Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3.
  url: 'https://www.3gpp.org/ftp/Specs/archive/24_series/24.560/'

```

servers:

```

- url: '{apiRoot}/aimlec-task-transfer/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122.

```

security:

```

- {}
- oAuth2ClientCredentials: []

```

paths:

```

/request:
  post:
    summary: Enables the AIMLE server to request the AIMLE client to perform AI/ML task transfer.
    operationId: AimlTaskTransf
    tags:
      - AI/ML task transfer
    requestBody:
      description: Contains the AIMLE client task transfer request information.
      required: true
      content:
        application/json:

```

```

    schema:
      $ref: '#/components/schemas/AimleClientTaskTransferReq'
  responses:
    '200':
      description: Contains the AIMLE client task transfer response information.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AimleClientTaskTransferRes'
    '204':
      description: No Content. The AIMLE client AI/ML task transfer is performed.
    '307':
      $ref: 'TS29122_CommonData.yaml#/components/responses/307'
    '308':
      $ref: 'TS29122_CommonData.yaml#/components/responses/308'
    '400':
      $ref: 'TS29122_CommonData.yaml#/components/responses/400'
    '401':
      $ref: 'TS29122_CommonData.yaml#/components/responses/401'
    '403':
      $ref: 'TS29122_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29122_CommonData.yaml#/components/responses/404'
    '411':
      $ref: 'TS29122_CommonData.yaml#/components/responses/411'
    '413':
      $ref: 'TS29122_CommonData.yaml#/components/responses/413'
    '415':
      $ref: 'TS29122_CommonData.yaml#/components/responses/415'
    '429':
      $ref: 'TS29122_CommonData.yaml#/components/responses/429'
    '500':
      $ref: 'TS29122_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29122_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29122_CommonData.yaml#/components/responses/default'

/request-direct:
  post:
    summary: >
      Enables the AIMLE client to request the target AIMLE client to perform AI/ML task transfer.
    operationId: DirAimlTaskTransf
    tags:
      - Direct AI/ML task transfer
    requestBody:
      description: Contains the AIMLE client direct task transfer request information.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AimleClientDirectTransferReq'
    responses:
      '204':
        description: No Content. The AIMLE client direct AI/ML task transfer is performed.
      '307':
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':

```

```

    $ref: 'TS29122_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29122_CommonData.yaml#/components/responses/default'

```

components:

```

securitySchemes:
  oAuth2ClientCredentials:
    type: oauth2
    flows:
      clientCredentials:
        tokenUrl: '{tokenUrl}'
        scopes: {}

```

schemas:

# Structured data types

```

AimleClientTaskTransferReq:
  description: Contains the AIMLE client task transfer request information.
  type: object
  required:
    - requestorId
    - sourceAimlId
    - aimlTaskType
    - aimlInfoType
  properties:
    requestorId:
      description: Represents the identifier of the AIMLE server.
      type: string
    sourceAimlId:
      $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
    aimlTaskType:
      $ref: 'TS24560_Aimles_AIMLEClientRegistration.yaml#/components/schemas/AimlOperation'
    aimlInfoType:
      $ref: '#/components/schemas/AimlInfoType'
    aimlTaskTransferTime:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
    timeValidity:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'

AimleClientTaskTransferRes:
  description: >
    Contains the AIMLE client task transfer response information. The aimlTaskTransferTime shall
    be present, although they are not specified as a mandatory due to backward compatibility
    reasons.
  type: object
  properties:
    aimlTaskTransferTime:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'

AimleClientDirectTransferReq:
  description: Contains the AIMLE client direct task transfer request information.
  type: object
  required:
    - requestorId
    - aimlTaskType
    - aimlInfoType
  properties:
    requestorId:
      $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
    aimlTaskType:
      $ref: 'TS24560_Aimles_AIMLEClientRegistration.yaml#/components/schemas/AimlOperation'
    aimlInfoType:
      $ref: '#/components/schemas/AimlInfoType'
    aimlTaskTransferTime:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
    timeValidity:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'

```

# Simple data types

# Enumerations

```

AimlInfoType:
  anyOf:

```

```

- type: string
  enum:
    - INTERMEDIATE_AIML_OP_RESULTS
    - INTERMEDIATE_AIML_OP_STATUS
    - FIRST_MATCH
- type: string
  description: >
    This string provides forward-compatibility with future extensions to the enumeration
    but is not used to encode content defined in the present version of this API.
description: |
  Represents the type of the AI/ML Information.
  Possible values are:
  - INTERMEDIATE_AIML_OP_RESULTS: Indicates the intermediate AI/ML operation results type
    of the AI/ML information.
  - INTERMEDIATE_AIML_OP_STATUS: Indicates the intermediate AI/ML operation status type of
    the AI/ML information.
  - FIRST_MATCH: Indicates other types of the AI/ML information.

```

---

## A.12 Aimles\_AimlTaskTransfer API

openapi: 3.0.0

```

info:
  title: Aimles_AimlTaskTransfer
  version: 1.0.2
  description: |
    API for AIMLE Server AI/ML Task Transfer Service.
    © 2026, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: >
    3GPP TS 24.560 V19.1.0; Artificial Intelligence / Machine Learning (AIML) Services – Service
    Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3.
  url: 'https://www.3gpp.org/ftp/Specs/archive/24_series/24.560/'

servers:
- url: '{apiRoot}/aimles-task-transfer/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 5.2.4 of 3GPP TS 29.122.

security:
- {}
- oAuth2ClientCredentials: []

paths:
  /assist-tt:
    post:
      summary: >
        Enables the AIMLE client to request the AIMLE server to perform task transfer assist.
      operationId: AimlTtAssist
      tags:
        - AI/ML task transfer assist
      requestBody:
        description: Contains the AIMLE server task transfer assist request information.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AimlesTaskTransferAssistReq'
      responses:
        '200':
          description: Contains the AIMLE server task transfer assist response information.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AimlesTaskTransferAssistResp'
        '307':
          $ref: 'TS29122_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29122_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'

```

```

'401':
  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
'403':
  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
'404':
  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
'411':
  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
'413':
  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
'415':
  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
'429':
  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
'500':
  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29122_CommonData.yaml#/components/responses/default'

```

```
/request-ctld:
```

```
  post:
```

```
    summary: >
```

```
      Enables the AIMLE client to request the AIMLE server to perform AIMLE server controlled task transfer.
```

```
    operationId: CtldAimlTt
```

```
    tags:
```

```
      - Controlled AI/ML task transfer
```

```
    requestBody:
```

```
      description: Contains the AIMLE server controlled task transfer request information.
```

```
      required: true
```

```
      content:
```

```
        application/json:
```

```
          schema:
```

```
            $ref: '#/components/schemas/AimlesControlledTaskTransferReq'
```

```
    responses:
```

```
      '200':
```

```
        description: Contains the AIMLE server controlled task transfer response information.
```

```
        content:
```

```
          application/json:
```

```
            schema:
```

```
              $ref: '#/components/schemas/AimlesControlledTaskTransferResp'
```

```
      '307':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/307'
```

```
      '308':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/308'
```

```
      '400':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
```

```
      '401':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
      '403':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
```

```
      '404':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
```

```
      '411':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
```

```
      '413':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
```

```
      '415':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
```

```
      '429':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
```

```
      '500':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
```

```
      '503':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
```

```
    default:
```

```
      $ref: 'TS29122_CommonData.yaml#/components/responses/default'
```

```
components:
```

```
  securitySchemes:
```

```
    oAuth2ClientCredentials:
```

```
      type: oauth2
```

```
      flows:
```

```
        clientCredentials:
```

```
          tokenUrl: '{tokenUrl}'
```

```
scopes: {}

schemas:

# Structured data types

AimlesTaskTransferAssistReq:
description: Contains the AIMLE server task transfer assist request information.
type: object
required:
- requestorId
- aimlTaskType
- aimlInfoType
properties:
requestorId:
  $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
valServiceId:
  description: >
    Represents identifier of the VAL service for which the assistance information
    is requested.
  type: string
aimlTaskType:
  $ref: 'TS24560_Aimles_AIMLEClientRegistration.yaml#/components/schemas/AimlOperation'
aimlInfoType:
  $ref: 'TS24560_Aimlec_AimlTaskTransfer.yaml#/components/schemas/AimlInfoType'
aimlRmngTrainReq:
  $ref: '#/components/schemas/AimlRmngTrainingReq'
aimlImdInfo:
  $ref: '#/components/schemas/AimlIntermediateInfo'
timeValidity:
  $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'

AimlesTaskTransferAssistResp:
description: Contains the AIMLE server task transfer assist response information.
type: object
required:
- assistanceTime
- targetAimlIds
properties:
assistanceTime:
  $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
targetAimlIds:
  description: List of the target AIMLE clients.
  type: array
  items:
    $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
  minItems: 1
transferMode:
  $ref: '#/components/schemas/TransferMode'

AimlesControlledTaskTransferReq:
description: Contains the AIMLE server controlled task transfer request information.
type: object
required:
- requestorId
- aimlTaskType
- aimlInfoType
- aimlTaskTransferTime
properties:
requestorId:
  $ref: 'TS29549_SS_UserProfileRetrieval.yaml#/components/schemas/ValTargetUe'
aimlTaskType:
  $ref: 'TS24560_Aimles_AIMLEClientRegistration.yaml#/components/schemas/AimlOperation'
aimlInfoType:
  $ref: 'TS24560_Aimlec_AimlTaskTransfer.yaml#/components/schemas/AimlInfoType'
aimlTaskTransferTime:
  $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
timeValidity:
  $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'

AimlesControlledTaskTransferResp:
description: Contains the AIMLE server controlled task transfer response information.
type: object
required:
- assistanceTime
properties:
assistanceTime:
  $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
```

```
AimlRmngTrainingReq:
  description: Contains requirements for AI/ML model training.
  type: object
  properties:
    reqRmngTrainResorce:
      description: Indicates required remaining training resource.
      type: string
    reqRmngTrainIterNum:
      description: Indicates required remaining training number of iterations.
      type: integer

AimlIntermediateInfo:
  description: Contains the AI/ML intermediate information for intermediate AI/ML operation.
  type: object
  properties:
    aimlImdModel:
      $ref: '#/components/schemas/AimlRmngTrainingReq'
    aimlUsedTrainTime:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
    usedTrainResource:
      description: Indicates used training resource.
      type: string
    usedTrainIterNum:
      description: Indicates used training number of iterations.
      type: integer
```

# Simple data types

# Enumerations

```
TransferMode:
  anyOf:
  - type: string
    enum:
      - DIRECT
      - SERVER_CONTROLLED
  - type: string
    description: >
      This string provides forward-compatibility with future extensions to the enumeration
      But is not used to encode content defined in the present version of this API.
  description: |
    Represents the mode of transfer.
    Possible values are:
    - DIRECT: Directly from the source AI/ML member to the target AI/ML member.
    - SERVER_CONTROLLED: Transfer with AIMLE server controlled.
```

## Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2024-10	CT1#151					TS skeleton for Artificial Intelligence Machine Learning (AIML) Services - Service Enabler Architecture Layer for Verticals (SEAL); Protocol Specification; Stage 3;	0.0.0
2024-10	CT1#151	C1-249006				Scope	0.1.0
2024-10	CT1#151	C1-249007				Security	0.1.0
2024-10	CT1#151	C1-245909				AIML Services Introduction	0.1.0
2024-10	CT1#151	C1-245910				Reference	0.1.0
2024-12	CT1#152	C1-246117				Correcting misadjustments	0.2.0
2024-12	CT1#152	C1-247040				Definitions and abbreviations	0.2.0
2024-12	CT1#152	C1-247080				Federated learning service	0.2.0
2024-12	CT1#152	C1-247081				Federated learning service API	0.2.0
2024-12	CT1#152	C1-247082				Federated learning service OpenAPI	0.2.0
2025-03	CT1#153	C1-251027				Pseudo CR on adding definitions related to AIML	0.3.0
2025-03	CT1#153	C1-251030				Split AIML operation pipeline service	0.3.0
2025-03	CT1#153	C1-251031				FL grouping indication data model	0.3.0
2025-03	CT1#153	C1-251032				Support of AIMLE client registration service	0.3.0
2025-03	CT1#153	C1-251033				Support of AIMLE Client Service Operations	0.3.0
2025-03	CT1#153	C1-251034				Support of AIMLE Client AI/ML Task Transfer API	0.3.0
2025-03	CT1#153	C1-251035				Support of AIMLE Server AI/ML Task Transfer API	0.3.0
2025-03	CT1#153	C1-251068				Correction to FL Service	0.3.0
2025-03	CT1#153	C1-251071				ML model retrieval service	0.3.0
2025-04	CT1#154	C1-252052				Support of ML model training capability evaluation	0.4.0
2025-04	CT1#154	C1-252054				Overview of AIMLE services	0.4.0
2025-04	CT1#154	C1-252055				Aimlec_FLGroupIndication API	0.4.0
2025-04	CT1#154	C1-252056				AIMLE server AIML task transfer service alignment	0.4.0
2025-04	CT1#154	C1-252057				AIMLE client AIML task transfer service alignment	0.4.0
2025-04	CT1#154	C1-252447				Split AIML operation pipeline service	0.4.0
2025-04	CT1#154	C1-252448				ML model retrieval service	0.4.0
2025-04	CT1#154	C1-252449				AIMLE client registration alignment	0.4.0
2024-05	CT1#155	C1-253385				Aimles_AIMLEClientRegistration API: DataSetAvailability definition	0.5.0
2024-05	CT1#155	C1-253386				OpenAPI file for Aimles_AIMLEClientRegistration API	0.5.0
2024-05	CT1#155	C1-253387				OpenAPI file for Aimlec_AIMLEClientServiceOperations API	0.5.0
2024-05	CT1#155	C1-253389				OpenAPI file for Aimlec_AimTaskTransfer API	0.5.0
2024-05	CT1#155	C1-253390				OpenAPI file for Aimles_AimTaskTransfer API	0.5.0
2024-05	CT1#155	C1-253391				OpenAPI file for Aimlec_MLModelTrainingCapabilityEva API	0.5.0
2024-05	CT1#155	C1-253392				AimModelInfo data type not listed in data model introduction	0.5.0
2024-05	CT1#155	C1-253393				Update of OpenAPI file for Aimlec_FLGroupIndication API	0.5.0
2024-05	CT1#155	C1-253395				FL group deletion flag in Aimlec_FLGroupIndication API	0.5.0
2024-05	CT1#155	C1-254011				ML model retrieval service API	0.5.0
2024-05	CT1#155	C1-254012				Split AIML operation pipeline API	0.5.0
2024-05	CT1#155	C1-254013				Aimlec_AimTaskTransfer API: support of 204 response	0.5.0
2025-06	CT#108	CP-251214				TS presented for information	1.0.0
2025-09	CT1#156	C1-254677				AIMLE client profile	1.1.0
2025-09	CT1#156	C1-255543				Update AIML client registration	1.1.0
2025-09	CT1#156	C1-255544				Client participation service	1.1.0
2025-09	CT1#156	C1-255545				Client participation service API	1.1.0
2025-09	CT1#156	C1-255546				Data management service	1.1.0
2025-09	CT1#156	C1-255547				Data management service API	1.1.0
2025-09	CT1#156	C1-255548				TL enablement service	1.1.0
2025-09	CT1#156	C1-255550				FL Group Indicator corrections	1.1.0
2025-09	CT1#156	C1-255690				TL enablement service API	1.1.0
2025-10	CT1#157	<a href="#">C1-256323</a>				Aimlec_ClientDataProcessing API	1.2.0
2025-10	CT1#157	C1-256325				HFL training service	1.2.0
2025-10	CT1#157	<a href="#">C1-256326</a>				HFL training service API	1.2.0
2025-10	CT1#157	C1-256811				Resolution of Editor's note for the Definition of MLModelProfile data type	1.2.0
2025-10	CT1#157	C1-256812				Resolving editor's note related to energy efficient performance	1.2.0
2025-10	CT1#157	C1-256813				Aimlec_AIMLEClientParticipation API	1.2.0
2025-10	CT1#157	C1-256814				Aimles_UeTLModelSelectionAssistance API	1.2.0
2025-10	CT1#157	C1-256815				Removal of edge and model distribution services	1.2.0
2025-10	CT1#157	C1-256816				Updating the ML model retrieval service	1.2.0
2025-10	CT1#157	C1-256817				Split operation event subscription service	1.2.0
2025-10	CT1#157	C1-256818				Defining update and delete operations for Split AIML operation pipeline service	1.2.0
2025-11	CT1#158	C1-257058				Changing API name for ML model training capability evaluation service	1.3.0
2025-11	CT1#158	C1-257061				Miscellaneous corrections	1.3.0
2025-11	CT1#158	C1-257240				To define the ML model update service operation	1.3.0
2025-11	CT1#158	C1-257241				To update the AIML split operation pipeline service operation	1.3.0

2025-11	CT1#158	C1-257312				Fixing Lint error in Aimlec_AIMLEClientParticipation API	1.3.0
2025-11	CT1#158	C1-257313				Fixing Lint error in Aimlec_ClientDataProcessing API	1.3.0
2025-11	CT1#158	C1-257314				Fixing Lint error in Aimles_UeTLModelSelectionAssistance API	1.3.0
2025-11	CT1#158	C1-257760				Complete CltDataProcResp	1.3.0
2025-11	CT1#158	C1-257761				HFL training OpenAPI	1.3.0
2025-11	CT1#158	C1-257762				Split AIML operation pipeline service OpenAPI	1.3.0
2025-11	CT1#158	C1-257800				AIML split operation pipeline service API	1.3.0
2025-12	CT#110	CP-253068				TS presentation to TSG CT for approval	2.0.0
2025-12	CT#110	CP-253068				Approved by TSG CT. Corrected name of the PerfParams data type and reference to the MLModelProfile data type, defined in TS 29.482.	19.0.0
2026-03	CT#111	CP-260133	0001	2	F	Terminology alignment with SA	19.1.0
2026-03	CT#111	CP-260116	0002		F	Corrections on the FL group member data	19.1.0
2026-03	CT#111	CP-260116	0003		F	Corrections on the FL member availability information	19.1.0
2026-03	CT#111	CP-260116	0004		F	Corrections on the FL member information indication	19.1.0
2026-03	CT#111	CP-260116	0005		F	Corrections on the outcome of the ML model training	19.1.0
2026-03	CT#111	CP-260116	0006		F	Corrections on the subId attribute	19.1.0
2026-03	CT#111	CP-260116	0007		F	Corrections on the task transfer response information	19.1.0
2026-03	CT#111	CP-260116	0008		F	Corrections on the triggering information	19.1.0
2026-03	CT#111	CP-260116	0009		F	Corrections on the type of the AIML Information	19.1.0
2026-03	CT#111	CP-260116	0010		F	Corrections on the uri of the AIMLE client registration	19.1.0
2026-03	CT#111	CP-260116	0011		F	Corrections on the uri of the HFL training subscription	19.1.0
2026-03	CT#111	CP-260116	0012		F	Update of info and externalDocs fields	19.1.0
2026-06	CT#112	CP-261111	0013		F	Correction on the incorrect URI	19.2.0
2026-06	CT#112	CP-261111	0014	1	F	Correction on the TL enablement service information	19.2.0
2026-06	CT#112	CP-261111	0023	1	F	Correcting API name	19.2.0
2026-06	CT#112	CP-261101	0030		F	Update of info and externalDocs fields	19.2.0

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## History

<b>Version</b>	<b>Date</b>	<b>Status</b>
V19.0.0	February 2026	Publication
V19.1.0	March 2026	Publication
V19.2.0	July 2026	Publication