**3GPP TSG-SA WG6 Meeting #60 S6-24xxxx**

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**Source: Lenovo,…**

**Title: AIMLAPP Architecture**

**Spec: 3GPP TR 23.700-82 v0.3.0**

**Agenda item: 8.3**

**Document for: Approval**

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**1. Introduction**

<Introduction part >

**2. Reason for Change**

< Explain the reason for change (mandatory)>

**3. Conclusions**

<Conclusion part (optional)>

**4. Proposal**

It is proposed to agree the following changes to 3GPP TS / TR <TS/TR number and version>.

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

# 7 Application architecture for enabling AI/ML services

## 7.1 General

The functional architecture enhancements for the ADAE with ML model training and management enablement function and AIML enablement service are based on the generic functional model specified in clause 6.2 of 3GPP TS 23.434 [7]. The architecture enhancements are organized into functional entities to describe a functional architecture enhancement which addresses the support for ML model training and management enablement function and AIML enablement aspects for vertical applications.

## 7.2 Application enablement architecture

### 7.2.1 On-Network AIML Enablement Layer Functional Architecture



Figure 7.2.1-1: On-network AIML enablement layer functional model

Figure 7.2.1-1 illustrates the on-network functional model of AIML enablement layer. In the vertical application layer, the VAL client communicates with the VAL server over VAL-UU reference point. VAL-UU supports both unicast and multicast delivery modes. The AIML enablement functional layer entities on the UE and the server are grouped into AIML enablement client(s) and AIML enablement server(s) respectively.

The AIML enablement layer includes of a common set of services for comprehensive enablement of AIML functionality, including federated and distributed learning (e.g., FL client registration management, FL client discovery and selection), and reference points. The AIML enablement services are offered to the vertical application layer (VAL).

The AIML enablement client communicates with the AIML enablement server(s) over the AIML-UU reference points. The AIML enablement client provides functionality to the VAL client(s) over AIML-C reference point. The VAL server(s) communicate with the AIML enablement server(s) over AIML-S reference points. The AIML enablement servers communicate with the underlying 3GPP network systems using the respective 3GPP interfaces specified by the 3GPP network system.

#### 7.2.1.1 Service-based AIML Enablement architecture representation

Figure 7.2.1.1-1 exhibits the service-based interfaces for providing and consuming AIML enablement services. The AIML enablement server could provide service to VAL server and AIML enablement client through interface SAiml.



Figure 7.2.1.1-1: Architecture for AIML enablement – Service based representation

Figure 7.2.1.1-2 illustrates the service-based representation for utilization of the 5GS network services based on the 5GS SBA specified in 3GPP TS 23.501 [a].



Figure 7.2.1.1-2: Architecture for AIML enablement utilizing the 5GS network services based on the 5GS SBA – Service based representation

The AIML enablement server as well as ADAES can be deployed as a SEAL server; hence enhancements to SEAL architecture (as specified in TS 23.434 [b]) are needed to incorporate the AIML enablement service. Figure 7.2.1-4 illustrates the service-based representation including AIML enablement server as part of the SEAL framework.



Figure 7.2.1.1-4: SEAL functional model representation using service-based interfaces and including AIML enablement function

### 7.2.2 Off-Network AIML Enablement Layer Functional Architecture



Figure 7.2.2-1: Off-network AIML enablement layer functional model

Figure 7.2.2-1 illustrates the off-network (UE-to-UE) functional model of AIML enablement layer. In the vertical application layer, the VAL client communicates with a further VAL client over VAL-PC5 reference point. VAL-PC5 supports both unicast and multicast delivery modes. The UE1, if connected to the network via Uu reference point, can also act as a UE-to-network relay, to enable UE2 to access the VAL server(s) over the VAL-UU reference point.

The AIML enablement client communicates with a further AIML enablement client(s) over the AIML-PC5 reference points. The AIML enablement client provides functionality to the VAL client(s) over AIML-C reference point. Such communication is performed for supporting local ML operations (training, distribution, inference) in a coordinated manner.

If the AIML enablement server is deployed as SEAL server, the off network functional architecture is similar to SEAL off-network architecture (as specified in TS 23.434 [5]).

### 7.2.3 Coexistence of ADAES and AIML enablement



Figure 7.2.3-1: Coexistence of ADAES and AIML enablement functional model

Figure 7.2.3-1 illustrates the on-network functional model of ADAE with ML Model Training and Management Enablement (MTME) function. In the vertical application layer, the VAL client communicates with the VAL server over VAL-UU reference point. VAL-UU supports both unicast and multicast delivery modes. The ADAE functional entities with MTME function on the UE and the server are grouped into ADAE client(s) and ADAE server(s) respectively. The ADAE with MTME function consists of a common set of services (e.g., ML model provision, (MTME-enhanced) ADAE client registration management, (MTME-enhanced) ADAE client member management, training status estimation, ML model training execution) and reference points. The ADAE offers its services to the vertical application layer (VAL).

The ADAE client(s) communicates with the ADAE server(s) over the ADAE-UU reference points. The ADAE client(s) provides the service enabler layer support functions to the VAL client(s) over ADAE-C reference points. The VAL server(s) communicate with the ADAE server(s) over the ADAE-S reference points. The ADAE server(s) may communicate with the underlying 3GPP network systems using the respective 3GPP interfaces specified by the 3GPP network system.

MTME-enhanced ADAES function supports ML capabilities (i.e. model training and management) to the ADAE service so that enhanced ADAE server/client are enabled to generate analytics results for supported analytics IDs using ML-enhanced methods.

For supporting MTME capabilities, the MTME-enhanced ADAE service assumes co-location of necessary AIML Enablement with ADAES (both as SEAL services), and their interactions are not detailed. As such, MTME-enhanced ADAE services and AIML enablement services are described in this document as complementary functions/ deployments.

### 7.2.4 Functional Entities Description

#### 7.2.4.1 General

The ADAE functional entities with ML model training and management enablement function are described in the following subclauses.

#### 7.2.4.2 ADAE client

The AI/ML ADAE client functional entity acts as the application client supporting ML model training and may supporting management of ML model training. It interacts with the AI/ML ADAE server.

#### 7.2.4.3 ADAE server

The ADAE server functional entity provides for management and execution of ML model training supported within the vertical application layer.

### 7.2.5 Reference Points Description

#### 7.2.5.1 General

The reference points for the functional model for management and execution of ML model training are described in the following subclauses.

#### 7.2.5.2 ADAE-UU

The interactions related to ML model training and management functions between the ADAE client and ADAE server are supported by ADAE-UU reference point. This reference point utilizes Uu reference point as described in 3GPP TS 23.401 [8] and 3GPP TS 23.501 [5].

ADAE-UU reference point is used for VAL service signalling for VAL service data management of the VAL service.

#### 7.2.5.3 ADAE-S

The interactions related to ML model training and management functions between the VAL server(s) and the ADAE server are supported by ADAE-S reference point.

#### 7.2.5.4 ADAE-C

The interactions related to ML model training and management functions between the VAL client(s) and the ADAE client within a VAL UE are supported by ADAE-C reference point.

\* \* \* End of Change \* \* \* \*