**3GPP TSG-SA WG6 Meeting #56 S6-23xxxx**

**Gothenburg, Sweden 21st – 25th August 2023 (revision of S6-23xxxx)**

**Source: Lenovo**

**Title: Study on application layer support for AI/ML services**

**Document for: Approval**

**Agenda Item: xx**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: Study on application layer support for AI/ML services

Acronym: FS\_AIMLAPP

Unique identifier: TBD

Potential target Release: Rel-19

# 1 Impacts

{For Normative work, identify the anticipated impacts. For a Study, identify the scope of the study}

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Affects: | UICC apps | ME | AN | CN | Others (specify) |
| Yes |  | X |  | X |  |
| No |  |  | X |  |  |
| Don't know | X |  |  |  | X |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
| x | Study  |
|  | Normative – Stage 1 |
|  | Normative – Stage 2 |
|  | Normative – Stage 3 |
|  | Normative – Other\* |

**\* Other = e.g. testing**

## 2.2 Parent Work Item

For a brand-new topic, use “N/A” in the table below. Otherwise indicate the parent Work Item.

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
|  |  |  |  |

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
| **940019** | FS\_ADAES | Rel-18 SA6 study on application data analytics enablement. |
| **970036** | ADAES | Rel-18 SA6 normative work on application data analytics enablement. |
| **920037** | AIML\_MT | Rel-18 SA1 work on traffic characteristics and performance requirements for AI/ML model transfer in 5GS. |
| **950008** | FS\_AIML\_MT\_Ph2 | Rel-19 SA1 study on performance requirements for AI/ML model transfer in 5GS for distributed scenarios (UE-to-UE). |

# 3 Justification

SA1 Rel-18 identified requirements (in TS 22.261) for the support of AI/ML model distribution, transfer, training for various applications (e.g., video/speech recognition, robot control, automotive) and has ongoing Rel-19 study on the ph2 for supporting Distributed AI training/inference based on direct device connection. Such use cases and requirements have application layer impacts but were not tackled in Rel-18.

SA6 has specified enablement services to ensure efficient use and deployment of vertical applications over 3GPP system. It is required to study and identify whether a new service is needed to provide assistance in AI/ML operations (model distribution, transfer and training) or any of the existing services can be enhanced to meet the requirements specified by SA1.

In addition, SA6 has specified the application layer architecture to enable data analytics as a new SEAL service, aka ADAES, in 3GPP TS 23.436. Such architecture provides an analytics enablement framework which offers generic analytics exposure and value-added services for verticals and ASPs. ADAES provides application layer analytics related to end to end application performance, edge load, service API availability, location accuracy and slice-related performance and fault analysis. In Rel-19, the ADAES functional architecture requires enhancements to further improve and enhance functionality in 3GPP for improved support for analytics and data collection aspects using AI/ML methods. Furthermore, the data management aspects need to be enhancement to offer a generic data collection coordination and storage entity which can be utilized by other SEAL services. Such discussions were limited in Rel-18 and can be further studied in Rel-19, also considering the AI/ML aspects and further coordination with other groups.

In the proposed study, the focus will be on supporting AI/ML enablement for:

1. Addressing SA1 requirements and in particular the support the application specific layer in the transfer/ distribution/ training.
2. Enhancing and potentially extending existing analytics enablement services as provided by SEAL ADAES.

Possible new areas of study include:

* Study new or enhancement of existing SA6 enablers (e.g. ADAES, EDGEAPP) for supporting AI/ML service enablement.
* Study the implications when using AI/ML methods for ADAES analytics. In particular, to study enhanced or new enablement capabilities for supporting ML model training / inference and federated learning in coordinated ADAES deployments.
* Study the enhancement of the data collection management framework to provide a generic model to be utilized across SA6 services.
* Investigate additional AI/ML-enabled analytics services or types given new vertical requirements (e.g. sensing analytics, energy analytics, fault analytics).
* Enhancements of edge analytics service to support more advanced EDGEAPP scenarios (e.g. support the selection of common EAS).
* Interworking with other analytics services both in 3GPP (NWDAF, MDAS) and non-3gpp.
* Support for utilizing digital twins as part of the AI/ML model lifecycle.

# 4 Objective

To study how to provide support for AI/ML services at application enablement layer. The objectives of the study are:

1) analyse Rel-18 and Rel-19 requirements in 3GPP TS 22.261 related to AI/ML model distribution, transfer, training and further identify key issues, develop corresponding architectural requirements and potential enhancements to the application layer architecture as required.

2) study architectural and functional implications on existing application enablers (e.g. ADAES and other SEAL services, EDGEAPP) for supporting AI/ML lifecycle operations (e.g. operations including the training/inference/federated learning and data management aspects).

3) study enhancements of the data management framework to provide a generic model to be utilized across SA6 services, as well as providing enhancements for supporting digital twin - produced data.

NOTE: for data management framework, coordination with other WGs is expected.

4) identify potential solutions as required, including the information flows and the APIs satisfying the architectural requirements and enhancements identified in bullets 1), 2) and 3).

5) investigate possible impacts of application layer support for AI/ML services for different deployments and business models, including also interworking with non-3gpp systems.

# 5 Expected Output and Time scale

|  |
| --- |
| New specifications {One line per specification. Create/delete lines as needed} |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Rapporteur |
| Internal TR | 23.XYZ | Study on enhancements to analytics enablement service; Phase 2 | TSG#105 | TSG#106 | Pateromichelakis Emmanouil *<epateromiche@lenovo.com>* |
|  |  |  |  |  |  |

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
|  |  |  |  |
|  |  |  |  |

# 6 Work item Rapporteur(s)

Pateromichelakis, Emmanouil (Manos), *epateromiche@lenovo.com*

# 7 Work item leadership

SA6

# 8 Aspects that involve other WGs

SA2 for system aspects, SA3 for security aspects, SA4 for media aspects and SA5 for management and charging aspects.

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| Lenovo |
| Samsung |
| CMCC |
| Convida Wireless LLC |
| InterDigital |
| ZTE |
| NTT DOCOMO |
| CATT |
| Telefonica |
|  |