**TSG-WG SA2 Meeting #163 S2-2407796**

**27 - 31 May 2024, Jeju, Korea (revision of S2-2406646)**

**Source: vivo, MediaTek Inc., China Mobile**

**Title: WID on Core Network Enhanced Support for Artificial Intelligence (AI)/Machine Learning (ML)**

**Document for: Approval**

**Agenda Item: 30.1**

**Work Item / Release: AIML\_CN / Rel-19**

*Abstract of the contribution: This contribution proposes the WID based on conclusion of TR 23.700-84(FS\_AIML\_CN)*

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: Core Network Enhanced Support for Artificial Intelligence (AI)/Machine Learning (ML)

Acronym: AIML\_CN

Unique identifier: xxxxxx

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 | X |  |
| No | X |  |  |  |  |
| Don't know |  |  |  |  |  |

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

|  |  |
| --- | --- |
| X | Feature |
|  | Building Block |
|  | Work Task |
|  | Study Item |

## 2.2 Parent Work Item

|  |
| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| FS\_AIML\_CN | SA2 |  | Study on Core Network Enhanced Support for Artificial Intelligence (AI)/Machine Learning (ML) |

### 2.3 Other related Work Items and dependencies

{List here other Work Items which relate to the proposed one, such as a Work Item in an earlier Release if further enhancing the feature from the previous Release)}

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
| 1020068 | Study on Core Network Enhanced Support for Artificial Intelligence (AI)/Machine Learning (ML) | Corresponding study of Core Network Enhanced Support for Artificial Intelligence (AI)/Machine Learning (ML) (SA2) |
| 940084 | Study on Artificial Intelligence (AI)/Machine Learning (ML) for NR Air Interface | Related study for RAN intelligence |
| 940073 | Study on Enablers for Network Automation for 5G – phase 3 | Related study for 5GC intelligence |
| 980019 | (Stage 2 for AIML) System Support for AI/ML-based Services | Related study for AIML |
| 941010 | Artificial Intelligence (AI)/Machine Learning (ML) for NG-RAN | Related study for AIML NGRAN aspects. |

# 3 Justification

The convergence of communication network and Artificial Intelligence (AI) technology is progressing based on work done in previous releases on AI-enabled network architecture and leveraging AI/Machine Learning (ML) to enable 5GC and air interface intelligence in terms of data collection, ML model training, analytics inference, and closed-loop procedures by consuming data analytics, etc. NWDAF mechanisms and enhancements have been defined in Rel. 16, Rel. 17, and Rel. 18. Moreover, Rel. 18 AIMLsys has introduced 5GC assistance capabilities to support AI/ML operations in the application layer specified in TS 22.261.

Based on the above, for Rel. 19 it is proposed to expand the scope of network AI services to leverage AI/ML technologies to enable 5GC and Air interface Intelligence by providing network automation and improving the efficiency of the 5G network architecture.

Two main components are considered for Rel. 19:

* AI/ML alignment and convergence for Air interface and 5G Core network
* Architecture enhancement to support 5G Core intelligence.

This work item aims at specifying system enhancements on Core Network Enhanced Support for Artificial Intelligence (AI)/Machine Learning (ML) as concluded within TR 23.700-84.

# 4 Objective

The objective is to specify the following enhancements to 5GS as per conclusions reached within clause 8 of TR 23.700-84 for the following aspects:

WT#1 For key issue #1 (Enhancements to LCS to support Direct AI/ML based Positioning)

- The LMF is enhanced to perform location calculation based on ML model, and the trigger for data collection and for model training in LMF is up to implementation

- The MTLF and the LMF are enhanced to perform ML model training for AI/ML based positioning

- The related procedures for data collection will be developed in coordination with RAN WGs

WT#2 For key issue #2 (5GC Support for Vertical Federated Learning)

- Enhance 5GC to support vertical federated learning (VFL), i.e. a federated learning technique without exchanging/sharing local data set or ML models, in the following scenarios:

- VFL among NWDAFs in a single PLMN.

- VFL between AF and NWDAF(s) in a single PLMN

WT#3 For key issue #3 (NWDAF-assisted policy control and QoS enhancement)

- Based on PCF request, NWDAF may provide assistance information to PCF to assist with QoS determination and modification of QoS parameters at PCF

WT#4 For key issue #4 (NWDAF enhancements to support network abnormal behaviours (i.e. signalling storm) mitigation and prevention)

- NWDAF supports assistance to signalling storm mitigation and prevention by providing analytics related to detections and predictions of signalling storm caused by massive number of UEs and/or NFs abnormal signalling

# 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 |
|  |  |  |  |  |  |

{Note 1: Only TSs may contain normative provisions. Study Items shall create or impact only TRs.
"Internal TR" is intended for 3GPP internal use only whereas "External TR" may be transposed by OPs.}

{Note 2: The first listed Rapporteur is the specification primary Rapporteur. Secondary Rapporteur(s) are possible for particular aspect(s) of the TS/TR. In this case, their responsibility has to be provided as "Remarks".}

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
| 23.288 | Impacts for model training for AIML based UE positioningImpacts of Vertical Federated LearningImpacts of NWDAF-assisted policy control and QoS enhancementImpacts due to new Analytics IDs related to signalling storm mitigation | SA#106 (December 2024) |  |
| 23.501 | Potential Impacts on services and NF discovery | SA#106 (December 2024) |  |
| 23.502 | Potential Impacts on services and call flows | SA#106 (December 2024) |  |
| 23.503 | Impacts of NWDAF-assisted policy control and QoS enhancement  | SA#106 (December 2024) |  |
| 23.273 | Impacts for location inference using AIML based UE positioning and potential impacts for model training for AIML based UE positioning | SA#106 (December 2024) |  |

# 6 Work item Rapporteur(s)

Primary Rapporteur: Xiaobo Wu, vivo (xiaobo.wu@vivo.com)

Secondary Rapporteur: Mehrdad Shariat, MediaTek Inc. (Mehrdad.Shariat@mediatek.com)

# 7 Work item leadership

SA2

# 8 Aspects that involve other WGs

Data collection for key issue 1 will be developed in collaboration with RAN WGs

Security aspects, if any, will be addressed by SA3.

Charging aspects, will be addressed by SA5.

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| China Mobile |
| ETRI |
| FirstNet? |
| Interdigital? |
| Lenovo? |
| KDDI |
| KPN |
| OPPO |
| Rakuten Mobile? |
| SK Telecom |
| Vivo |
| Deutsche Telekom |
| Telefonica? |
| Verizon? |
| BT? |
| CATT |
| China Telecom? |
| China Unicom? |
| MATRIXX Software? |
| AT&T? |
| Intel? |
| Cybercore |
| LG Uplus? |
| DISH Networks? |
| Futurewei? |
| NTT Docomo |
| Nokia |
| ZTE |
| Xiaomi? |
| Qualcomm |
| Mediatek Inc. |
| Meta? |
| Huawei |
| HiSilicon |
| Cisco? |
| Apple? |
| Ericsson |
|  Samsung |
| ICS |