**3GPP TSG-CT WG1 Meeting #150 C1-244079**

**Maastricht, NL, 19 – 23 August 2024**

**3GPP TSG-CT WG3 Meeting #136C3-244034**

**Maastricht, NL, 19 - 23 August 2024**

**3GPP TSG-CT WG4 Meeting #124C4-243175**

**Maastricht, NL, 19 - 23 August 2024**

**Source: vivo**

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

**Document For: Approval**

**Agenda Item: 19.1.1 (CT1) / 19.1.1 (CT3) / 5.2 (CT4)**

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: WID on CT aspects of Core Network Enhanced Support for Artificial Intelligence (AI)/Machine Learning (ML)

Acronym: AIML\_CN

Unique identifier: xxx

Potential target Release: *Rel-19*

# 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Affects:** | UICC apps | ME | AN | CN | Others (specify) |
| **Yes** |  |  |  | X |  |
| **No** | X |  |  |  | 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 …

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

## 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) |
| AIML\_CN | SA2 | 1040033 | Core Network Enhanced Support for Artificial Intelligence (AI)/Machine Learning (ML) |

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
| 940073 | Study on Enablers for Network Automation for 5G - phase 3 | Related to enhancement study of NWDAF in Rel-18 |
| 980020 | Enablers for Network Automation for 5G phase 3 | Related to enhancement work of NWDAF in Rel-18  |
| 940084 | Study on Artificial Intelligence (AI)/Machine Learning (ML) for NR Air Interface | Related study for RAN intelligence |
| 941010 | Artificial Intelligence (AI)/Machine Learning (ML) for NG-RAN | Related study for AIML NG-RAN aspects |
| 980019 | (Stage 2 for AIML) System Support for AI/ML-based Services | Related to support for analytics exposure and federated learning |
| 940058 | Study on Enhancement to the 5GC LoCation Services-Phase 3 | Related to 5GC LoCation Services enhancement in Rel-18 |
| 870001 | Enhancement to the 5GC LoCation Services-Phase 2 | Related to 5GC LoCation Services enhancement in Rel-17 |
| 820016 | Enhancement to the 5GC LoCation Services | Related to 5GC LoCation Services enhancement in Rel-16 |

**Dependency on non-3GPP (draft) specification:**

N/A.

# 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.

Stage 2 has studied the system enhancements on Core Network Enhanced Support for Artificial Intelligence (AI)/Machine Learning (ML) under the Rel-19 "FS\_AIML\_CN" study item. The conclusions of the study are captured in 3GPP TR 23.700-84. TSG-SA meeting SA#104 approved the "AIML\_CN" work item as specified in SP-240991 and normative stage 2 work is currently under development.

Therefore, it is necessary for a new CT work item to implement the stage-2 requirements and address the stage 3 protocol enhancement.

# 4 Objective

The objective of this work is to specify the CT aspects of Core Network Enhanced Support for Artificial Intelligence (AI)/Machine Learning (ML) in order to implement the stage 2 normative work. The stage 3 work shall be started after the applicable normative stage 2 requirements are available, the detail impacts are subject to change when stage 2 normative CRs are agreed.

The following aspects of work are expected to be covered:

**CT1:**

Editor's note: The CT1 impacts of supporting Direct AI/ML based positioning are FFS and are based on the progress of SA WG2. The sources of data, specified data used for model training, inference and model performance monitoring for AI/ML based positioning will be decided by RAN WGs. The impacted specification (e.g. 3GPP TS 24.501, 3GPP TS 24.571, 3GPP TS 24.572) should be determined based on the detailed impacts.

Editor's note: The CT1 impacts of supporting signalling storm mitigation and prevention are FFS based on the progress of stage-2.

**CT3:**

- For Direct AI/ML based Positioning:

- update on NWDAF to support Direct AI/ML based Positioning, e.g., AI positioning model training, AI positioning model delivery, performance monitoring;

- potential update on NWDAF to support data collection for AI positioning model training;

- For Vertical Federated Learning (VFL):

- update on NWDAF and AF to support sample alignment for VFL;

- update on NWDAF and AF to support VFL training;

- update on NWDAF and AF to support VFL inference;

- potential update on NWDAF and AF to support performance monitoring for VFL;

- potential update on NEF to support VFL in case of an untrusted AF;

- For NWDAF-assisted policy control and QoS enhancement:

- update on PCF and NWDAF to support the analytics for QoS and policy assistance information;

- potential update on NFs and AF to support input data collection;

- potential update on NWDAF to support performance monitoring for NWDAF-assisted policy control;

- For signalling storm mitigation and prevention:

- update on NWDAF to support analytics for signalling storm Mitigation and Prevention caused by NFs;

- update on NWDAF to support analytics for Signalling storm Mitigation and Prevention caused by massive signalling of UEs;

- potential update on NFs to support input data collection;

- Potential impacts on ADRF, DCCF, and MFAF APIs for supporting the data sources or analytics.

**CT4:**

- For Direct AI/ML based Positioning:

- update on LMF to support Direct AI/ML based positioning;

- potential update on NFs to support training data collection for AI positioning model;

- potential update to MTLF discovery via NRF for training ML model for Direct AI/ML based Positioning;

- For Vertical Federated Learning:

- update on NRF to support VFL entity registration and discovery;

- For NWDAF-assisted policy control and QoS enhancement:

- potential update on NFs to support input data collection;

- For signalling storm mitigation and prevention:

- potential update on NFs to support input data collection;

- potential update to SCP entity to support acting as a source of input data.

# 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 |
| N/A |  |  |  |  |  |

|  |
| --- |
| Impacted existing TS/TR {One line per specification. Create/delete lines as needed} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| 29.508 | Potential update on NFs to support input data collection for signalling storm mitigation and prevention; | TSG#109(September 2025) | CT3 |
| 29.513 | Update on PCF to support the analytics for QoS and policy assistance information | TSG#109(September 2025) | CT3 |
| 29.517 | 1. Update on AF to support sample alignment for VFL;2. Update on AF to support VFL training; 3. Update on AF to support VFL inference; 4. Potential update on AF to support performance monitoring for VFL;5. Potential update on AF to support input data collection; | TSG#109(September 2025) | CT3 |
| 29.520 | 1. Potential update on NWDAF to support data collection for AI positioning model training;2. Update on NWDAF to support sample alignment for VFL;3. Update on NWDAF to support VFL training; 4. Update on NWDAF to support VFL inference; 5. Potential update on NWDAF to support performance monitoring for VFL;6. Update on NWDAF to support the analytics for QoS and policy assistance information;7. Potential update on NWDAF to support performance monitoring for NWDAF-assisted policy control;8. Update on NWDAF to support analytics for signalling storm Mitigation and Prevention caused by NFs;9. Update on NWDAF to support analytics for Signalling storm Mitigation and Prevention caused by UEs; | TSG#109(September 2025) | CT3 |
| 29.522 | 1. Potential update on NEF to support VFL in case of an untrusted AF;2. Potential update on NEF to support input data collection for NWDAF-assisted policy control and QoS enhancement;3. Potential update on NEF to support input data collection for signalling storm mitigation and prevention | TSG#109(September 2025) | CT3 |
|  |  |  |  |
| 29.525 | Update on PCF to support the analytics for QoS and policy assistance information; | TSG#109(September 2025) | CT3 |
| 29.552 | 1. Potential update on NWDAF to support data collection for AI positioning model training;2. Update on NWDAF to support VFL;3. Update on NWDAF to support the analytics for QoS and policy assistance information;4. Update on NWDAF to support analytics for signalling storm Mitigation and Prevention caused by NFs and massive signalling of UEs.  | TSG#109(September 2025) | CT3 |
| 29.574 | Potential impacts on DCCF API for supporting the new or extended data sources or analytics. | TSG#109(September 2025) | CT3 |
| 29.575 | Potential impacts on ADRF API for supporting the new or extended data sources or analytics. | TSG#109(September 2025) | CT3 |
| 29.576 | Potential impacts on MFAF API for supporting the new or extended data sources or analytics. | TSG#109(September 2025) | CT3 |
| 29.591 | 1. Potential update on NEF to support VFL in case of an untrusted AF;2. Potential update on NEF to support input data collection for NWDAF-assisted policy control and QoS enhancement;3. Potential update on NEF to support input data collection for signalling storm mitigation and prevention  | TSG#109(September 2025) | CT3 |
| 24.080 | Potential update on NFs to support training data collection for AI positioning model | TSG#109(September 2025) | CT4 |
| 29.500 | Potential update to SCP entity to support acting as a source of input data | TSG#109(September 2025) | CT4 |
| 29.503 | Potential update on NFs to support training data collection for AI positioning model; | TSG#109(September 2025) | CT4 |
| 29.510 | 1. Update on NRF to support MTLF discovery for training ML model for AI/ML based Positioning;2. Update on NRF to support VFL entity registration and discovery;3. Potential update on NFs to support input data collection; | TSG#109(September 2025) | CT4 |
| 29.515 | Potential update on NFs to support training data collection for AI positioning model; | TSG#109(September 2025) | CT4 |
| 29.518 | 1. Potential update on NFs to support training data collection for AI positioning model;2. Potential update on NFs to support input data collection. | TSG#109(September 2025) | CT4 |
| 29.572 | 1. Update on LMF to support Direct AI/ML based positioning;2. Potential update on NFs to support training data collection for AI positioning model; | TSG#109(September 2025) | CT4 |

# 6 Work item Rapporteur(s)

Yizhong ZHANG, vivo, yizhong.zhang@vivo.com

# 7 Work item leadership

CT3

# 8 Aspects that involve other WGs

SA3 for the security aspects.

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| vivo |
| China Mobile |
| China Telecom |
| CATT |
| Ericsson |
| Nokia |
| ZTE |
| Huawei |
| InterDigital |
| Xiaomi |
| Lenovo |