**SA WG2 Meeting #161 *draft\_*S2-240xxxx-r01**

**Athens, GREECE, February 26 – March 01, 2024**

**Source: vivo, Huawei, HiSilicon, Ericsson**

**Title: Miscellaneous Corrections of Key Issues**

**Document for: Approval**

**Agenda Item: 19.15**

**Work Item / Release:** **FS\_AIML\_CN / Rel-19**

*Abstract of the contribution: This contribution proposes miscellaneous corrections of Key Issues.*

# 1 Discussion

There are several editorial and unclear components in the key issues, such as the incorrect use of capitalization and unclear language. Therefore, this contribution aims to address and resolve these issues.

# 2. Proposal

It is proposed to do the following modifications to TR 23.700-84.

Start of Changes

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 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[3] 3GPP TS 23.502: "Procedures for the 5G system, Stage 2".

[4] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System".

[5] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[6] 3GPP TR 38.843: "Study on Artificial Intelligence (AI)/Machine Learning (ML) for NR air interface".

[x] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS)".

Next Change

4 Architectural Assumptions and Requirements

The present study will not consider service-based interfaces with RAN and with UE.

The architecture for the present study shall comply with the existing NWDAF framework as specified in TS 23.288 [5], and 5GS framework as specified in TS 23.501 [2], TS 23.502 [3] and TS 23.503 [4].

The architecture for the present study shall comply with the existing Location Service Architecture and LMF role as specified in TS 23.273 [x].

NOTE 1: The study will consider the related work done by SA WG5, CT WG4 and reuse it when possible.

NOTE 2: Security aspects are to be addressed by SA WG3.

Regarding AI/ML cross-domain coordination aspects, work will be based on the possible requirements defined by RAN WGs considering the conclusions in TR 38.843 [6].

NOTE 3: UE data collection, model delivery and transfer to the UE and model identification/management are not within the scope of the study.

NOTE 4: RAN and UE is out of scope for any AI/ML operations related to Vertical Federated Learning, VFL.

### Editor's note: NOTE 3 should also be reflected in description of key issue for objective WT#1.4 and NOTE 4 should also be reflected in description of key issue for objectiveWT#2.

Next Change

### 5.2.0 Mapping of Key Issues to Use Cases

Table 5.2.0-1: Mapping of Key Issues to Use Cases

|  |  |
| --- | --- |
| Key Issues | Use cases |
| #1 | Positioning accuracy enhancements,  case 2b: UE-assisted/LMF-based positioning with LMF-side model, direct AI/ML positioning  case 3b: NG-RAN node assisted positioning with LMF-side model, direct AI/ML positioning.  Both defined in TR 38.843 [6]. |
| NOTE: Not all Key Issues require related Use Cases. | |

Next Change

### 5.2.1 Key Issue #1: Enhancements to LCS to support Direct AI/ML based Positioning

This key issue aims to provide solutions for whether and how to consider enhancements to support AI/ML based positioning for case 2b, 3b as defined in TR 38.843 [6], which will investigate the following aspects:

- Study whether and how an AI/ML model for direct AI/ML positioning (i.e. case 2b/3b) is handled:

- Which entity trains the model for direct AI/ML positioning and if the entity that train the model and the consumer are different, how the model consumer gets the trained AI/ML model;

- Which entity act as the model consumer that will use the trained model to perform inference and/or derive UE position;

- Define procedures for data collection from 5GC NFs and/or OAM with objective to train AI/ML models for direct AI/ML positioning.

- Whether and how to support direct AI/ML positioning at LMF with additional 5GC enhancements.

- How to monitor model performance for ML models used for direct AI/ML based positioning.

This key issue considers that the positioning functionality is handled at LMF, as described in the architecture assumption.

NOTE 1: UE data collection, model delivery and transfer to the UE and model identification/management are not within the scope of this key issue.

NOTE 2: What data to be collected for the model training/model inference/model performance monitoring for direct AI/ML positioning (i.e. case 2b/3b) needs to be coordinated with RAN WGs. The existing data defined by RAN WG, and collected from the UE or from RAN will be considered as input for model training/inference and performance.

NOTE 3: Any potential impacts for case 1/2a/3a in TR 38.843 [6], are out of the scope and any potential alignment work will be based on the possible requirements defined by RAN WGs considering the conclusions in TR 38.843 [6].

Next Change

### 5.2.2 Key Issue #2: 5GC Support for Vertical Federated Learning

This key issue aims to provide solutions for enabling 5GC support for vertical federated learning (VFL) involving NWDAF and/or AF, where no raw data need to be exchanged but some level of coordination is still required when training and inference are performed on local models. In particular, datasets used for each local model need to share the same samples while holding different features.

In Rel-18, ML model sharing between NWDAFs has been studied as a part of Horizontal Federated Learning. However, federated learning between NWDAF and AF has not been studied (e.g. when the NWDAFs and/or AFs are in different domains, locations, regions etc).

Vertical Federated Learning (VFL) can be considered as an alternative mechanism for distributed functionalities of an ML model. Note that, as scoped in Rel-19, NWDAF and/or AF may be involved for VFL.

This Key Issue aims to study architecture enhancement to support VFL, which allows the cooperative AI/ML training and inference with the following aspects:

- Identify VFL use cases and under which conditions, and for which entities these VFL use cases show that VFL is justified to train ML models.

- Whether and how to support architecture enhancement for supporting VFL for model training and/or inference. In particular:

- Whether and how the existing NF discovery and selection needs to be enhanced.

- Whether and how ML Model training and/or inference related procedures need to be enhanced to support VFL.

- Whether and how to do performance monitoring for the ML model trained via VFL.

- Whether and how to provide ML Models to the participants in the VFL training process.

- How to support sample and feature alignment among the participating network entities when performing VFL.

NOTE 1: Application layer-based VFL requiring communication between AFs and/or UEs application client, is out of scope.

NOTE 2: During the study on this KI, consultation with SA WG3 is required for handling security aspects.

NOTE 3: RAN and UE aspects are out of scope.

NOTE 4: The existing procedures defined for Horizontal FL in TS 23.288 [5] will be taken into account when studying the procedure for VFL.

Next Change

### 5.2.3 Key Issue #3: NWDAF-assisted policy control and QoS enhancement

The NWDAF can gather quite a lot of data from 5GC NFs, AF and OAM and thus may further assist the PCF in making PCC decisions (which traditionally determine QoS parameters based on its own data and knowledge as well optional statistics and predictions collected from the NWDAF).

This key issue aims to study whether and what is additionally needed to be supported in order to enhance 5GC NF operations related to policy control and QoS with the assistance of the NWDAF.

In this key issue, the following aspects will be studied:

- Identification of use cases where policy control and QoS can be further enhanced with assistance from NWDAF.

- Whether and how to introduce new 5GC functionality e.g. of the NWDAF and/or PCF to enhance the policy control and QoS, considering operator's policies.

- Whether and what additional input information is needed by the NWDAF for providing an assistance to policy control and QoS, and how to gather it.

- Whether and what output information, on top of already provided, the NWDAF can provide to assist with policy control and QoS enhancements.

- Whether and how to evaluate the quality of the enhanced NWDAF assistance to policy control and QoS.

NOTE 1: The study will focus primarily on existing enforcement mechanisms when available and identify new ones only when no existing ones can be used.

Next Change

### 5.2.4 Key Issue #4: NWDAF enhancements to support network abnormal behaviours (i.e. signalling storm) mitigation and prevention

This key issue aims to provide solutions for prediction, detection, prevention, and mitigation of network abnormal behaviours, i.e. signalling storm, with the assistance of NWDAF. In particular, the following aspects will be addressed:

- Identify scenarios that can result in a signalling storm situation.

- Whether and how existing analytics or new analytics can be used to assist detection and/or prediction of signalling storm, including aspects of input /output data that needs to be collected/provided by the NWDAF.

What NF(s) will be consumer of such analytics and whether and how they can use them.

- Whether and how signalling storm can be prevented and/or mitigated based on the inputs provided by NWDAF.

NOTE 1: In terms of data access right, privacy and security improvement, cooperation with SA WG3 is needed.

NOTE 2: The study of this key issue will consider the study/work done by SA WG5 and CT WG4 in this regard already and collaborate with SA WG5/CT WG4 regarding the handling of abnormal network behaviours.

End of Changes