**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **x** |

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| ***Title:***  | KI#1: Allignment with SA3 decisions on User Consent check and LCS privacy check |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** | S2 |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | Regarding the applicability of user consent and the LCS profile for model training performance monitoring and location inference for LMF side models, the following editor´s notes need to be resolved:Editor's note: Whether user consent for UE positioning calculation is needed apart from the existing GMLC check of the LCS privacy profile is FFS.Editor's note: Further details on user consent for data collection for a specific purpose, e.g. for model training and/or for performance monitoring for LMF-based AI/ML positioning will be aligned with SA WG3.SA3 reached a related working agreement that was subsequentley confirmed by SA plenary and is now documented in TS 33.501 as follows:***X.11.2 Security for data collection for the LMF-based AI/ML positioning****User consent for model training as per 6.1.6.3.20 of 29.503 [93] and performance monitoring for LMF-based AI/ML positioning as specified in clause 6.22 of TS 23.273 [86] is required based on regional regulations or operator’s local policy, for which Annex V of the present document applies. For UE location determination utilizing the trained model, LCS privacy profile is sufficient, and Annex V of the present document is not required. The LMF is deemed as enforcement point as specified in clause 6.22.3 of TS 23.273 [86].*TS 23.502 Table 5.2.3.3.1-1 (UE Subscription data types) defines the user consent as stored in the UDM as follows:

| *User consent (see TS 23.288 [50])* | *User consent for UE data collection* | *Indicates whether the user has given consent for collecting, distributing and analysing UE related data. User consent is provided per purpose (e.g. analytics, model training).* |
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| ***Summary of change:*** | For ML model training and performance monitoring using LMF-based AI/ML Positioning, the LMF checks with UDM the user consent for porpose “model training” before collecting UE related data, see clause 6.22.3 and clause 6.22.4.NOTE 5: For UE positioning calculation utilizing the trained model, procedures related to the LCS privacy profile in Clause 5.4 apply, but a user consent check is not required. |
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| ***Consequences if not approved:*** | Unresolved Editor´s notes regarding the applicability of user consent and the LCS profile for model training performance monitoring and location inference for LMF side models and misalignment with TS 33.501. |
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| ***Clauses affected:*** | 4.3.6, 5.18.0, 6.22.3 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

1st change

### 4.3.6 UDM

The UDM contains LCS subscriber LCS privacy profile and routing information. The UDM is accessible from an AMF, GMLC or NEF via the Nudm interface.

The UDM may also contain an indication whether a UE is allowed to serve as a PRU and indication whether PRU is stationary PRU as part of the UE subscription data.

The UDM may also contain LMF identifier(s) and indication of user plane positioning between UE and LMF in UE LCS subscription data.

The UDM may also contain user consent information for a UE. For model training and performance monitoring related to LMF based models for AI/ML positioning, the LMF checks the user consent at the UDM before collecting UE related data.

2nd change

### 5.18.0 General

The LMF may calculate the UE location and estimate the achieved accuracy by using LMF-based AI/ML Positioning. When receiving the request from AMF for determining a UE location, the LMF selects an appropriate positioning method as described in clause 5.2 to determine the result of the positioning. The result of the positioning may be calculated by using LMF-based AI/ML Positioning ML model supported by LMF. The LMF collects input data from UE or NG-RAN for the LMF-based AI/ML Positioning to perform location calculation and provide the location to the consumer.

NOTE 1: Whether to select LMF-based AI/ML Positioning for location result calculation is determined by LMF.

NOTE 2: The specific measurement data collected by LMF from NG-RAN for LMF-based AI/ML Positioning are in the scope of RAN specifications and not in the scope of this specification.

Editor's note: What input data collected from UE and NG-RAN to LMF for LMF-based AI/ML Positioning will be determined by RAN WG1.

The ML model that is used for LMF-based AI/ML Positioning may be trained by LMF. The trigger for data collection required for model training in LMF is up to implementation. LMF collects input data from UE for ML model training as described in clause 6.22.2. The LMF collects input data from NG-RAN for ML model training as described in clause 6.22.3.

The LMF may also request a trained ML model for LMF-based AI/ML Positioning from NWDAF containing MTLF as described in clause 6.22.5. The LMF discovers a suitable NWDAF containing MTLF via NRF as described in clause 5.2 of TS 23.288 [37] with the following considerations:

- The LMF may provide the positioning case information(i.e. NG RAN node assisted LMF-based AI/ML Positioning case).

NOTE 3: The positioning case information only indicates the NG RAN node assisted LMF-based AI/ML Positioning in this release.

- The LMF provides an Area of Interest, and may include the ML Model Interoperability indicator to discover an NWDAF that can provide an AI/ML Model.

- The LMF may request a NWDAF with ML Model accuracy checking capability to report when the model is degraded (i.e. for ML model performance monitoring).

NOTE 4: Other NWDAF discovery parameters listed in clause 5.2 of TS 23.288 [37] such as Analytics ID, FL capability type and related time period, S-NSSAI or any roaming capabilities are not included by LMF.

The LMF requests the NWDAF containing MTLF to provide an ML Model for LMF-based AI/ML Positioning as described in clause 6.2A of TS 23.288 [37] with the following considerations:

- The LMF provides the following input parameters in the Nnwdaf\_MLModelProvision\_Subscribe or Nnwdaf\_MLModelInfo\_Request:

- LMF-based AI/ML positioning indication.

- Optionally, Vendor ID, ML Model Filter Information (e.g. Area of Interest), Positioning case information, Target of ML Model Reporting, ML Model Target Period, Time when model is needed, Inference Input Data information and ML Model Monitoring Information.

- If vendor specific information is required , then the ML Model Interoperability Information is included.

- If the LMF supports multiple AI/ML Models, indication of support for multiple ML Models, optionally with Number of ML Models and Accuracy level(s) of Interest.

The NWDAF containing MTLF collects input data to perform the ML model training as described in clause 6.22.4, and the NWDAF containing MTLF performs ML model provision to LMF as described in clause 6.2A of TS 23.288 [37] with the following considerations:

- The NWDAF containing MTLF provides the ML Model identifier and ML Model Information for the ML Model for UE Positioning, and optionally, the following parameters:

- ML Model Filter Information and/or Target of ML Model Reporting, if the ML Model provisioning request includes multiple ML Model Filter Information and/or Target of ML Model Reporting;

- Indication of whether the ML Model identifier is updated (e.g. retrained ML model).

- Validity period, Spatial validity, Training Input Data Information, ML Model accuracy Information.

Once the ML model for LMF-based AI/ML Positioning is trained and available in the LMF, the LMF may use it to perform UE Positioning after receiving a location determination request from AMF.

For ML model training and performance monitoring using LMF-based AI/ML Positioning, the LMF checks with UDM the user consent for purpose “model training” before collecting UE related data, see clause 6.22.3 and clause 6.22.4.

NOTE 5: For UE positioning calculation utilizing the trained model, procedures related to the LCS privacy profile in Clause 5.4 apply, but a user consent check is not required.

Either LMF or NWDAF containing MTLF may perform performance monitoring for LMF-based AI/ML Positioning. When the ML model that is used for LMF-based AI/ML Positioning is trained by LMF the LMF monitors the performance of the ML model. When the ML model that is used for LMF-based AI/ML Positioning in LMF is trained by NWDAF containing MTLF, then the NWDAF containing MTLF monitors the performance of the ML model. LMF may determine whether to use the LMF-based AI/ML Positioning to perform location calculation based on the model performance monitoring result. LMF or the NWDAF containing MTLF may also trigger the ML model retraining based on the model performance monitoring result.

3rd change

### 6.22.3 Data collection to train models for LMF-based AI/ML positioning based on NG RAN measurements

The procedure for data collection from NG-RAN is used to e.g. train the ML Model for LMF-based AI/ML positioning.



Figure 6.22.3-1: Data collection by LMF to train the AI/ML based positioning model using NG-RAN measurements

1. The LMF determines that data collection from the NG-RAN is required e.g. to train an ML Model for UE positioning for a number of UEs or to monitor the ML Model performance. The LMF may also initiate the data collection upon the request of an NWDAF containing MTLF as described in step 3 in figure 6.22.4-1.

2. The LMF may know the SUPIs of the UEs for which to collect location measurement data from the NG-RAN, e.g. when training an ML model using the PRU(s) associated to this LMF. The LMF may optionally invoke an Nnrf\_NFDiscovery Request service operation to an NRF to discover other PRU serving LMF(s) which has associated PRUs in the area of interest and send an Nlmf\_Location\_MeasurementData Request service operation to the selected PRU serving LMFs to collect the measurement data from the NG-RAN for the PRUs and the PRU locations.

 If the LMF does not know the SUPIs of the UEs for which to collect location measurement data from the NG-RAN, the LMF tries to get the list of SUPIs from the AMF. Before that the LMF discovers the AMF(s) that serves the area of interest via the NRF using Nnrf\_NFDiscoveryRequest.

3. The LMF subscribes to the list of SUPIs in an area of interest from the AMF(s) using Namf\_EventExposure\_Subscribe request (Target of Event Reporting = "any UE", Event ID = "UEs in/out area of interest").

 The AMF sends Namf\_EventExposure\_Subscribe response or Namf\_EventExposure\_Notify (list of SUPIs in the area of interest).

 For each SUPI in the area of interest, the following steps are performed.

4. The LMF checks whether the SUPI provided user consent for purpose “model training” with UDM using Nudm\_SDM\_Get including subscription data type set to "User consent" for this SUPI.

 The LMF may further determine the UEs from the list of SUPIs that are received from AMF in step 3 for data collection based on e.g. UE Positioning Capability, UE User Plane Positioning Capabilities, the PRU information available in the LMF and operator's policy. The LMF may query the UE for UE Positioning Capability and optionally UE User Plane Positioning Capabilities if not received in step 3.

5. The LMF subscribes to UDM to notifications of changes on subscription data type "User consent" for this SUPI using Nudm\_SDM\_Subscribe. If user consent for purpose “model training” is granted, then step 6 follows, otherwise no data is collected for this SUPI, i.e. the following steps are not performed.

6. The LMF requests input data for the UE from the NG-RAN using the Measurement Information Transfer procedures in NRPPa as specified in clause 8.5 of TS 38.455 [15].

NOTE: The NG-RAN can reject the data collection request from the LMF (e.g. considering current NG-RAN load status).

7. The LMF requests ground truth data from the UE. The UE may reject the data collection request from the LMF (e.g. considering UE status, user's input). If the UE accepts data collection request, the UE may cancel the data collection later as defined in clause 6.3.4.

8. The LMF may determine that the UE is no longer in the area of interest, based on the AMF notification using Namf\_EventExposure service, then the LMF performs step 10 and step 11, the LMF may unsubscribe to be notified on user consent updates if the UE is not in the area of interest any longer.

9. The UDM may notify the LMF on changes of user consent at any time after step 5 using Nudm\_SDM\_Notification including SUPI and Subscription data type set to "User consent". If user consent is no longer granted for a user for which data has been collected the LMF performs step 10 and step 11. The LMF may unsubscribe to be notified of user consent updates from UDM for each SUPI for which data consent has been revoked, using Nudm\_SDM\_Unsubscribe including SUPI and Subscription data type set to "User consent".

10. The LMF requests NG-RAN to stop reporting input data for the UE.

11. The LMF stops any retrieval of ground truth data for the UE.

The measurements from NG-RAN and ground truth data from PRU/UE are used for ML model training. The UE location is derived from the measurements data by using LMF-based AI/ML Positioning. The derived UE location and ground truth data are used for ML model performance monitoring.

The LMF may initiate data collection for multiple UEs simultaneously, as such steps 6 and 7 may occur in parallel for a number of SUPIs as determined by the LMF.

Editor's note: The procedure to collect the input data for AI/ML based positioning calculation by the LMF from the NG-RAN is subject to RAN WG progress.

End of changes