**3GPP TSG-SA2 Meeting #170 *S2-2507725***

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**Source: Interdigital**

**Title: KI#5, New Sol:** **sensing service request based on location of a UE**

**Document for: Approval**

**Agenda Item: 20.2.1**

**Work Item / Release: FS\_Sensing\_ARC / Rel-20**

*Abstract: The solution for KI#5 sensing result exposure for a sensing service request based on a location of a UE is proposed.*

# 1. Introduction

This pCR proposes the solution for Key issue#5 sensing result exposure for AF initiated sensing and UE initiated sensing based on location of a UE.

Revision from 6556:

1. Editor’s Note is added relating to UE as service consumer in high level solution principles.
2. Editos’ Note is added whether AF may request sensing service using target UE ID.
3. Editor’s Node is added whether UE initiated service request may be transferred via UP or via CP.
4. Figures are updated to make sure only gNode B used as sensing entity.
5. Clarification on how to acquire target UE’s location by providing example (e.g. by querying serving AMF of target UE with target UE’s ID or by initiating a location service procedure according to TS 23.273 to acquire the target UE’s current location.).
6. Requested sensing mode and other parameters are removed in the service request as gNode B based monostatic sensing is considered in RAN.
7. AMF is added at the Impact relating to NAS message transfer for UE initiated sensing service request between UE and a Sensing NF.

# 2. Text Proposal

It is proposed to capture the following changes in TR 23.700-14.

\* \* \* \* First change \* \* \* \*

# 6 Solutions

## 6.0 Mapping of Solutions to Key Issues

Table 6.0-1: Mapping of Solutions to Key Issues

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Key Issues | | | | | |
| Solutions | 1 | 2 | 3 | 4 | 5 | 6 |
| X |  | X |  |  | X |  |

\* \* \* \* Second change (All text new) \* \* \* \*

## 6.X Solution #X: procedures for sensing service based on location of a UE

### 6.X.1 High-level solution Principles

Application Function, UE, or a Network Function may be allowed as a sensing service consumer.

Editor’s note : it is FFS whether UE may be allowed as a sensing service consumer and need to be coordinated with SA3.

A sensing service consumer may request a sensing service (for a one-time report, a periodic report, or an event triggered report) based on a target sensing service area or for a location of target UE.

When a Sensing Service Consumer request a periodic or event triggered sensing operation for a target UE, a sensing control function may trigger a network initiated periodic sensing operation based on the location of a target UE. When a UE request a sensing service as a sensing service consumer, the UE may request a sensing service based on its location.

When sensing service consumer initiate a sensing service request, it is authorized by a sensing control function. When a UE initiate a sensing service request as a sensing service consumer, it may be authorized based on the UE’s subscription data.

When a UE is allowed to act as a sensing service consumer, the UE may request a sensing service for a target sensing service area or for its own location as a target UE and the sensing result may be consumed by the UE itself or by another sensing service consumer indicated by the UE.

### 6.X.2 Description

When an SSC (sensing service consumer) requests a sensing service for periodic or event triggered sensing report, the sensing service report start time, end time, periodicity, and triggering condition (if event triggered report is requested) are included.

When a sensing service is authorized, the gateway sensing NF may assign a Sensing Operation ID to represent the authorized sensing operation. The upcoming sensing operation and relevant signalling will include the Sensing Operation ID to correlate the sensing operations and the sensing result to the authorized sensing operation.

When an AF as an SSC request a sensing service with a target UE, the sensing NF may initiate a location service procedure to get the location information of the target UE so that the requested sensing operation may be performed at an area around the location of the target UE. During location service procedure for a target UE, the target UE may accept or reject the location service as specified in TS23.273. If the target UE rejects to provide the location, the sensing service may be considered as not authorized and the sensing NF may respond the request from the AF as rejected.

A UE as an SSC may request a sensing service based on its location. The UE may inform its location in the sensing service request, or a location service procedure may be triggered to gather the UE’s location information.

When a UE sends a sensing service request, it may be delivered to the AMF via UL NAS Transport. When the AMF receives a sensing service request from a UE, the AMF selects a gateway sensing NF to forward the request. The Sensing NF may authorize the sensing service request from a UE based on UE’s subscription data and availability of sensing operation at a target sensing service area which is determined based on UE’s location or UE’s requested sensing service area.

When a sensing service is requested by AF for a periodic sensing service based on target UE’s location which may require periodic location service procedure, the sensing NF may request the target UE to perform periodic sensing operation based on target UE’s location. When target UE accept the request, the sensing NF may respond AF as the sensing service is authorized. And the target UE may initiate the procedure for UE initiated sensing service request based on the target UE’s location at the requested period and the sensing service request includes the sensing operation ID which indicated at the request from the sensing NF.

### 6.X.3 Procedure for sensing service based on location of a UE

#### 6.X.3.1 Procedure for AF initiated sensing service request



Figure 6.X.3-1 Procedure of the periodic sensing operation per target service area

1. The AF requests a service request for sensing. The request includes sensing service type (object detection, object tracking, environment sensing, etc) and sensing service requirements (e.g., accuracy, latency, resolution, etc). The service request for sensing may include a target region or a target UE.

The service request for sensing may include sensing report type such as one time service report, periodic sensing service report, and event triggered sensing service report.

When a periodic sensing service report is requested, sensing report start time, sensing report ending time and periodicity of sensing report may be included.

When an event triggered sensing service report is requested, sensing report start time, sensing report ending time and sensing report triggering condition (e.g., detecting an object in the target sensing service area, detecting an object leaving target sensing service area, etc)

When the AF is an untrusted entity, the request may be sent to the sensing NF via NEF.

Editor’s Note: It is FFS whether AF can request a sensing service using target UE ID.

1. When the sensing service is requested with a target UE, the gateway sensing NF may acquire target UE’s location (e.g., by querying serving AMF of target UE with target UE’s ID or by initiating a location service procedure according to TS 23.273 to acquire the target UE’s current location.) to derive the target seinsing service area. .

NOTE: During location service procedure, if AF is not allowed for target UE’s location, the sensing service request is considered as not authorized.

3. The gateway sensing NF may authorize the sensing service request from the AF.

4 The gateway sensing NF may send a service response to the AF (via NEF). It may include whether the service request is accepted or rejected with proper cause value. If authorized, the response may include a sensing operation ID which may represent the requested sensing service. When a sensing result is provided, the sensing operation ID is included in the sensing response to represent the requested sensing service.

5. The gateway sensing NF discovers a (distributed) sensing NF to serve the requested sensing operation at the target sensing service area.

When there is a (distributed) sensing NF which manages sensing operation at the target sensing service area, the gateway sensing NF may send a request for sensing operation to the (distribute) sensing NF. The sensing operation request may include requested sensing service type and requirement, and candidate list of sensing entities and a sensing operation ID.

6. When receiving a sensing operation request with a target sensing service area, a (distributed) sensing NF for the target sensing service area may perform discovery and selection procedure. The (distributed) sensing NF selects gNode B as sensing entity for periodic sensing operation with the requested period.

7. The (distributed) sensing NF determines the information for the subsequent sensing measurement and sends a sensing request to the selected gNode B as sensing entity, time information for periodic sensing operation, and configuration for the sensing operation with the selected gNode B as sensing entity, and a sensing operation ID.

The sensing operations for a sensing operation ID repeat step 8 to step 11 based on the configured duration and periodicity.

If the event triggered report is requested, the operation may stop when triggering condition is met.

8. Upon receiving the sensing service request from (distributed) sensing NF, the gNode Bperforms sensing measurement and obtain 3GPP sensing data as configured by the (distributed) sensing NF

9. The gNode Bmay provide the collected sensing measurement data with a sensing operation ID and assistance information to the sensing NF (via signaling message or data connection).

When a data connection is used to transport the collected sensing data, the information to set up the data connection may be included in step 7 or may be preconfigured.

10. The (distributed) sensing NF may calculate the sensing result based on the collected sensing measurement data.

If the sensing NF detects the sensing operation may not satisfy the requirement for the requested sensing operation, it may update the sensing entity for the remaining period by performing step 6.

11. The (distributed) sensing NF may provide sensing result to the gateway sensing NF including a sensing operation ID.

12. The gateway sensing NF send a sensing result to the AF which requested sensing request of the sensing operation ID based on the requested reporting manner (periodic report or event triggered report). The sensing response may include sensing operation ID to associate the pending sensing service request.

#### 6.X.3.2 Procedure for UE initiated sensing service request



Figure 6.X.3-1 Procedure of UE initiated sensing service request

1. The UE sends a Service Request for Sensing in a UL NAS Transport message. The Service Request for Sensing may indicate a specific type of sensing service request (e.g., object detection and tracking, environmental detection, motion detection, etc), time information for requested sensing operation. And the UE’s ID and/or target region information in which the sensing is to be executed may be included. The service request may include specific requirements for the sensing service, e.g. sensing accuracy, latency, sensing frequency, resolution, etc.

If the service request is related to a pending sensing service (e.g., periodic sensing service, event triggered sensing service), it may include a sensing operation ID associated with the pending sensing service.

Additionally, the UE may include sensing service consumer information as a recipient of sensing result if UE is not the sensing service consumer.

2. The AMF may send a sensing service request to a gateway sensing NF.

If there is no dedicated sensing NF for authorization, AMF may discover a sensing NF to serve the sensing service area including UE’s location and send the sensing request to the sensing NF.

Editor’s Note: It is FFS whether the service request from UE may be transferred via UP or via CP.

3. After receiving a sensing service request, the sensing NF may trigger location service procedure as specified in TS23.273 to derive the target sensing service area based on the UE’s location.

4. Based on UE’s subscription data, the requested sensing service may be authorized.

After authorization of the sensing request, the sensing operation may be coordinated by a (distributed) sensing NF which serve the target sensing service area. In this case, a gateway sensing NF may discover and select a (distributed) sensing NF and send a sensing request to the (distributed) sensing NF.

The gateway sensing NF may assign a sensing operation ID for the requested sensing operation if a sensing operation ID for any pending sensing operation is not included in the request from the UE. The sensing operation ID is included in the sensing request to the (distributed) sensing NF.

5. After the sensing service is authorized, a (distributed) sensing NF may select sensing entities for sensing operation at the target sensing service area. Sensing entities may be selected based on their registered capability. The gateway sensing NF may provide the candidate sensing entities to the (distributed) sensing NF.

6. A (distributed) sensing NF sends a sensing request to the selected gNode B as sensing entity.

A sensing request message may include the time for sensing operation, any configuration information for sensing operation, and a sensing operation ID.

Editor’s Note: the content of the configuration information will be determined in collaboration with RAN WGs.

7. Based on the configuration, the gNode B collects sensing measurement data.

8. The gNode B may provide the collected sensing measurement data with a sensing operation ID and assistance information to the sensing NF (via signaling message or data connection).

When a data connection is used to transport the collected sensing data, the information to set up the data connection may be included in step 6 or preconfigured.

9. The (distributed) sensing NF may calculate the sensing result based on the collected sensing measurement data.

10-11. The sensing NF may send the result to the sensing service consumer (to UE, or to an indicated sensing service consumer received in UE’s service request for sensing) or to a sensing NF based on the indicated sensing operation ID in the UE’s service request.

#### 6.X.3.3 Procedure for periodic sensing service request to target UE



Figure 6.X.3-2 Procedure of the periodic sensing operation with target UE

1. The AF requests a service request for sensing as shown in clause 6.x.3.1. In this case, the requested sensing service is based on the location of target UE.

Editor’s Note: It is FFS whether AF can request a sensing service using target UE ID.

2. – 4. steps as shown in clause 6.x.3.1

5. The gateway sensing NF discovers a (distributed) sensing NF to serve the requested sensing operation at the target sensing service area. When there is a (distributed) sensing NF which manages sensing operation at the target sensing service area, the gateway sensing NF may send a request for sensing operation to the (distribute) sensing NF. The sensing operation request may include requested sensing service type and requirement.

When a periodic sensing operation based on the latest target UE’s location at the time of sensing operation is requested, the target UE’s ID is included. (For example, periodic object detection is requested based on target UE’s location.)

6. The (distributed) sensing NF may send a request to the target UE with a indication that request a UE initiated sensing service request based on UE’s location for periodic sensing or event triggered sensing and requested time information. The sensing request includes the sensing operation ID which will be used to associate the upcoming UE initiated sensing service request by the target UE with the pending sensing service request.

7. The target UE may send a response with acceptance, if accepted. The target UE may accept or reject the requested sensing service based on the internal privacy context for sensing operation which includes an allowed list of AF info per sensing service type.

8. After receiving the accept, the (distributed) sensing NF may send a sensing response with an indication that the target UE accepted the UE initiated sensing request for the requested sensing operation with requested time.

9. The gateway sensing NF may send a service response for sensing to the AF.

10. The target UE performs UE initiated sensing operation periodically with requirements based on the requested time as shown in clause 6.x.3.2.

### 6.X.4 Impacts on services, entities and interfaces

AF:

- Support sensing request and revocation service with request for periodic, event triggered sensing report

Sensing NF:

- Support sensing service authorization and revocation and coordinate sensing operation with sensing entity

- Request a UE initiated sensing service request to the target UE

gNode B (as Sensing Entity):

* Performs periodic sensing operation in coordination of sensing NF.

UE (as Sensing Service Consumer)

* Support UE initiated sensing service request
* Response to a request for a UE initiated sensing service procedure from Sensing NF

AMF

* Transfer NAS messages relating to a sensing service request from UE to Sensing NF.

\* \* \* \* End of changes \* \* \* \*