**3GPP TSG-WG SA2 Meeting #170 S2-250xxxx**

**Gothenburg, Sweden, August 25 - 29, 2025 (revision of S2-250xxxx)**

**Source: Ericsson, LG Electronics, Nokia**

**Title: Discussion on Support of Device Location in Ambient IoT**

**Document for: Agreement**

**Agenda Item: 19.14.2**

**Work Item / Release: AmbientIoT-ARC / Rel-19**

*Abstract: This Discussion Paper discusses the support of Device Location in Ambient IoT in Rel-19.*

**1. Introduction**

In SA2#169, S2-2504888 proposed the solution to support Device Location in Ambient IoT. It was not handled due to lack of time. In our view, this function is an alignment with RAN WGs. Without accurate positioning solution designed, it can fulfil SA1 positioning requirement to some extent.

In TS 22.369, there is a positioning requirement in clause 5.2.2:

*The 5G system shall support location services for Ambient IoT devices (e.g., to locate Ambient IoT devices using absolute or relative positioning methods)*

*NOTE 1: The intention is not to use Ambient IoT devices to locate other Ambient IoT devices.*

**[Observation-1]** Location Service is required for Ambient IoT as a basic requirement.

In conclusion of TR 38.769, there are some conclusions about device location:

*6.9.1 General*

*A-IoT device location information may be used for the following purposes:*

*(a) improving the A-IoT operation itself, e.g., by A-IoT CN sending a Command to one or more readers (e.g., the last reader(s)) associated to the device rather than sending it blindly.*

*(b) providing location information to the consumer of the A-IoT service.*

*Locating an Ambient IoT device at* *"reader ID granularity" is useful for both purposes and is to be supported.*

*NOTE: "reader ID granularity" is likely not sufficient for purpose (b) and may be refined in the future.*

*6.9.2 Topology 1*

*For support of A-IoT device location, the A-IoT RAN node may report the A-IoT RAN node ID to the A-IoT CN in the Inventory Report or Command Response messages.*

*The A-IoT RAN node may additionally report a Reader ID to the A-IoT CN in the Inventory Report and/or the Command Response messages, which corresponds to the reader to which the A-IoT device responded.*

*NOTE 1: Whether multiple Reader ID(s) can be included by the A-IoT RAN node in the Inventory Report/Command Response message needs further discussion.*

*NOTE 2: Definition and format of the A-IoT RAN node ID and Reader ID needs further discussion.*

*NOTE 3: Whether and how to have awareness of Reader location in A-IoT CN needs further discussion.*

**[Observation-2]** NG-RAN supports the location service in Rel-19. The AIoT device location is provided at “reader ID granularity”, while the awareness of reader location in CN is FFS.

In the LS from RAN3 (R3-250905), RAN3 inform SA2 about the progress, which includes the supporting of location support in NG-RAN:

* *AIOTF may also be aware of the other A-IoT RAN information (location of reader) via OAM configuration, FFS on RAN3 signalling for the other A-IoT RAN information...*
* *……*
* *The gNB always sends the A-IoT device’s location at reader ID granularity to the AIOTF in Inventory Report.*

**[Observation-3]** The reader ID is always provided in the Inventory Report, and the location of the reader may be configured in the AIOTF by OAM.

In TS 23.369, the texts related to location service are included in clause 5.3.3:

*The AIOTF obtains the NG-RAN selection information (AIoT Area list, RAN Reader list, and, optionally, the location served by each RAN Reader and each AIoT Area) via OAM or local configuration.*

*……*

*NOTE 3: An AIOTF receives the Inventory Report from an NG-RAN node includes a RAN Reader ID that represents the AIoT Device’s location at Reader granularity.*

However, there are no descriptions in the inventory and command procedures on how the location of each RAN reader can be utilized. There are also no descriptions about how the AIOTF informs the AF about the device locations.

**[Observation-4]** According to TS 23.369, the location of each RAN reader can be provisioned by OAM, but not utilized.

**[Proposal-1]** Support location service in Rel-19 to align with RAN3 and fulfil SA1 requirement.

**[Proposal-2]** The location is provided at reader granularity level which aligns with the RAN.

For the location information of the device, the AIOTF receives from NG-RAN at reader ID level. If the AIOTF is configured with the location of the reader, the AIOTF can provide the location of the reader to the AF as the device location.

**[Proposal-3]** The AIOTF provides the location of the reader as the location of the device to the AF.

Regarding when the location information should be provided to the AF, it should depend on whether AF has requested and whether the AF is authorized to receive the location information. If the target area is sufficient small and the AF does not need finer granularity of the device location information, the AF does not have to request the location information. And thus, the network does not need to provide it, which will bring some signaling efficiency to some extent.

Ideally, the network also needs to further check whether the AF is authorized to receive the location information. However, thinking from use case perspective, if the AF is authorized to perform the inventory request towards a target area for the target devices, there are no issues for the AF to get the location of those devices.

And in our view, it provides further flexibility and enables the control from MNO, if the AIOTF can determine whether to provide location information based on operator policy. The operator policy is provisioned based on SLA between the MNO and the AF (e.g., the MNO may not want to provide location information to some AFs. For some AFs, the MNO may decide only to provide location information once a day or restrict the location information for the devices in a certain area).

**[Proposal-4]** Based on operator policy, if the location information is requested by the AF and if the reader location information is configured, the AIOTF provides the location information of the reader as the location of the AIoT Device to the AF.

**[Proposal-5]** No additional AF authorization for the location information.

**2. Proposal**

**[Proposal-1]** Support location service in Rel-19 to align with RAN3 and fulfil SA1 requirement.

**[Proposal-2]** The location is provided at reader granularity level which aligns with the RAN.

**[Proposal-3]** The AIOTF provides the location of the reader as the location of the device to the AF.

**[Proposal-4]** Based on operator policy, if the location information is requested by the AF and if the reader location information is configured, the AIOTF provides the location information of the reader as the location of the AIoT Device to the AF.

**[Proposal-5]** No additional AF authorization for the location information.

It is proposed to agree on TS 23.369 CRxxxx (S2-250xxxx).