**3GPP TSG RAN Meeting #109 RP-25xxxx**

**Beijing, P.R. China, September 15-18, 2025**

**Agenda Item: 9.2.3**

**Source: Moderator (RAN1 Vice-Chair)**

**Title: Moderator summary on R20 Ambient IoT**

**Document for: Discussion and decision**

# Introduction

At RAN#109, contributions were submitted to address the decision point for the Rel-20 study item on Ambient IoT [1] pertaining to the potential addition of a study objective on positioning:

* RAN#109 to decide whether to include an objective on positioning / proximity determination in the scope for Rel-20 study item

One contribution additionally provided a discussion on the coverage target for the Rel-20 study.

Contributions were also submitted for scope clarification of the Rel-20 work item on Ambient IoT [2], regarding the architecture solution for Topology 2, and asking for clarification on the support for handover.

This document provides a summary of the proposals in these contributions, and a discussion on how to address these proposals.

# Summary of contributions for the SID

Release 19 Ambient IoT supports Device localization based on Reader ID, which will remain applicable with inventory and command for active device(s) in Rel-20 based on protocols specified in Rel-19. At RAN#109, some companies are proposing to study more accurate localization methods or proximity determination solution 2 in Rel-20.

The discussion on positioning at RAN#108 resulted in a checkpoint for RAN#109. A proposed study objective discussed during RAN#108 was the following:

* Study the support of A-IoT positioning in indoor and outdoor scenarios for active device(s), focusing on UL, i.e. in D2R, and network based positioning, and considering the findings from the Rel-19 study of proximity determination solution 2 [RAN1~~-led, RAN3, RAN2~~]
* D1T1 for indoor and D4T1 for outdoor
* Representative use cases rUC3 (indoor positioning) and rUC7 (outdoor positioning).
* Evaluate the achievable positioning accuracy [RAN1]
* ~~Support of A-IoT positioning procedure [RAN3, RAN2]~~
* ~~Coordination with relevant SA WGs is expected.~~
* Note: positioning solutions studied under this objective are expected to be equally applicable for outdoor and indoor scenarios for Device 2b/Device C
* RAN#109 to decide whether to include this objective in the scope for Rel-20, and attempt to further narrow-down the targeted candidate network-based positioning technique(s).
* RAN#111 (March 2026) will make a decision on whether to include positioning in Rel-20 normative work.

For companies who provided a contribution to RAN#109, the views on studying positioning for Ambient IoT in Rel-20 are the following:

* Support studying techniques for more accurate Device localization than Reader-ID:
  + Huawei, HiSilicon (D2R-based fingerprinting e.g., RSRP fingerprint)
  + CATT (single-reader D2R-based and network-based)
  + IIT Kanpur (solutions with higher accuracy than studied for Rel-19 proximity determination)
  + CMCC (positioning/proximity determination based on measurement at the Reader side)
* Consider proximity determination:
  + Spreadtrum, UNISOC (based on proximity determination enhancement)
  + Qualcomm (Simple single-point ranging like technique based on e.g., RSRP (inc. reader side or device side measurement), RTT measurements, etc)
  + Apple (if considered feasible for outdoor scenarios, consider specifying proximity determination solution 2 rather than studying positioning methods)
* Could accept a study with limited scope without additional TU:
  + OPPO (E-CID based positioning as a starting point, no or minimal additional device impact)
  + Ericsson (cell-ID-like solutions and/or proximity determination solution 2, no additional TU, no impact to system architecture, measurements based on existing signals)
* Do not support adding a study objective on positioning in Rel-20:
  + ZTE Corporation, Sanechips (concerns on workload and TU availability)
  + NTT Docomo (concerns on workload and TU availability)
  + Xiaomi (unless TU is made available, if so study both proximity determination and positioning)
  + MediaTek (online): need additional TU in RAN1. Can it be discussed in June 2026?

Some companies also proposed detailed objectives, as shown below:

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| **Source** | **Proposed objective** |
| Huawei | * Identify the candidate technique: fingerprint-based (e.g., RSRP fingerprint) solution is feasible for A-IoT outdoor positioning. * Define the evaluation assumption.Most simulation parameters can leverage existing positioning assumptions from 3GPP TR 38.855, TR 38.859, and A-IoT-specific assumptions in TR 38.769, ​​except for the following aspects**:**   + **​​**Positioning Reference Signal: A-IoT communication signals/channels as the starting point, e.g., PDRCH.   + Device-dependent factors: E.g. SFO and CFO for active device as per Rel-20 SI agreements. * Evaluate positioning performance of the candidate techniques. |
| CMCC | * Study and evaluate potential positioning solutions based on reader measurements * Study necessary signals/procedures/interfaces to support potential positioning solutions * Note: the solutions applicable for both indoor and outdoor scenarios, and for all device types. |
| CATT | Study the support of A-IoT positioning in indoor and outdoor scenarios for active device(s), focusing on UL , i.e. in D2R signal(s) to a single reader, and network based positioning, and considering the findings from the Rel-19 study of proximity determination solution 2 [RAN1]   * D1T1 for indoor and D4T1 for outdoor * Representative use cases rUC3 (indoor positioning) and rUC7 (outdoor positioning). * Evaluate the achievable positioning accuracy [RAN1] * Note: positioning solutions studied under this objective are expected to be equally applicable for outdoor and indoor scenarios for Device 2b/Device C |
| Qualcomm | * Study the feasibility of positioning/proximity techniques for Device 2b/C considering   + Simple single-point ranging like technique based on e.g., RSRP (inc. reader side or device side measurement), RTT measurements, etc.   + Target accuracy to be decided accordingly   + Applicability to both T1 and T2 |

# Possible SID update

Based on the online discussion on Monday, a proposal with minimal scope is provided below. It is assumed that the proposal would not require TU adjustment but be handled as best-effort in RAN1.

**Proposal 1: Update the SID with the addition of the following study objective:**

Study D2R measurements (e.g., RSRP-like), and the involved A-IoT signal(s)/channel(s), which are feasible for network-based positioning technique(s) for Device 2b/Device C with more accurate Device localization than based on Reader-ID [RAN1].

* Findings from the Rel-19 study of proximity determination solution 2 can be considered.
* Evaluation of positioning accuracy by RAN1 is not expected as part of this study objective

Feel free to provide comments on proposal 1 using the table below

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| Company | Comment on the proposal |
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Please use the following convention for updating the file name in the inbox draft folder, for example:

* Draft\_v01\_Moderator
* Draft\_v02\_Moderator\_CompanyA
* Draft\_v03\_CompanyA\_CompanyB
* Draft\_v04\_CompanyB\_CompanyC
* Etc

# Conclusions

TBD

# References

1. RP-251884 Rel-20 Ambient IoT outdoor SID, RAN#108
2. RP-251885 Rel-20 Ambient IoT Phase 2 WID, RAN#108
3. RP-251971 Discussion on support of A-IoT positioning or proximity determination in Rel-20 Guangdong OPPO Mobile Telecom.
4. RP-252058 Views on enhancements for Ambient IoT in NR NEC
5. RP-252156 Discussion on R20 A-IoT positioning Spreadtrum, UNISOC
6. RP-252314 Study on Ambient IoT in Outdoor for Active Devices Apple Inc.
7. RP-252345 Revised SID: Study on enhancements for solutions for Ambient IoT (Internet of Things) in NR outdoor for active devices LG Electronics Inc.
8. RP-252363 Addition of study on positioning for Rel-20 Ambient IoT Huawei, HiSilicon
9. RP-252458 Views on Ambient IoT SI in Rel-20 Qualcomm Incorporated
10. RP-252653 Discussion on Rel-20 Ambient IoT SI scope Xiaomi
11. RP-252707 Views on Positioning objective of Ambient IoT works in Rel-20 CATT
12. RP-252757 Views on Rel-20 Ambient IoT SI IIT Kanpur
13. RP-252758 Views on including positioning in the scope of Rel-20 Ambient IoT SI Ericsson Canada Inc.
14. RP-252030 Views on Rel-20 Ambient IoT ZTE Corporation, Sanechips
15. RP-252059 Views on solutions for Ambient IoT in NR Phase 2 NEC
16. RP-252081 TU allocation and WID revision for Rel-20 AIoT in NR Phase 2 Xiaomi
17. RP-252103 Consideration on Ambient IoT positioning for outdoor scenarios CMCC
18. RP-252362 Revised WI: Solutions for Ambient IoT (Internet of Things) in NR Phase 2 Huawei
19. RP-252477 Views on Ambient IoT in Rel-20 NTT DOCOMO, INC.