3GPP TSG RAN WG2 Meeting #124 R2-231XXXX

Chicago, USA, 13th– 17th November 2023

Agenda Item: 7.7.1

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Title: Remaining Issues on NR Non-Terrestrial Networks (NTN)

Document for: Information

# Introduction

This document aims at summarizing open issues that need to be addressed for NR Non-Terrestrial Networks enhancements Work Item in RAN2 [1] following the RAN2#123-bis meeting [2].

# Discussion

**Coverage enhancement remaining open issues**

* To specify PUCCH enhancements for Msg4 HARQ-ACK (e.g. repetition) [RAN1, RAN4]
  + Define a new LCID extension value for Msg3 indication for PUCCH repetition for Msg4 HARQ-ACK only for random access procedure triggered by RRC connection establishment, RRC connection re-establishment or RRC connection resume

**Network verified UE location remaining open issues**

* RAN to prioritize the specification of necessary enhancements to multi-RTT to support the network verified UE location in NTN assuming a single satellite in view [RAN1, 2, 3, 4]. RAN1 already concluded the work during the last meeting. RAN3 is discussing solutions on mirror-image ambiguity issues, including E-CID and neighbour cell measurement
  + Discuss on UE location failure during cell change after LS [3] reply from RAN3

**Cell reselection enhancements remaining open issues**

* Specify cell reselection enhancements for RRC\_IDLE/INACTIVE UEs to reduce UE power consumption (NTN-TN mobility is prioritized). [RAN2, RAN3, RAN4]
  + Define the not essential SIB to provide the TN coverage information in NTN cell
  + Discuss on broadcast of NTN information in TN cell for NTN-TN service continuity
* For NTN-NTN mobility, specify cell reselection enhancements for earth moving cell, the timing based and location-based cell reselection for quasi-earth fixed cell in Rel-17 can be considered as the starting point. [RAN2, RAN3, RAN4]
  + Discuss measurements on neighbour cells during hard cell switch / feeder link switch
  + Discuss if the network needs to inform UE the type of the next cell switch (hard or soft) and if it is needed, how to inform the UE (implicitly or explicitly)

**Handover enhancements remaining open issues**

* Specify NTN-TN and NTN-NTN measurement/mobility and service continuity enhancements [RAN2,RAN3,RAN4]
  + Remaining details of unchanged PCI scenario
    - Detail exact signalling of the target satellite information (i.e. NTN-config) of serving cell in SIB19
    - Discuss on SMTC configuration of target satellite
    - Detail the indication to be provided to UE whether hard switch or soft switch is used
    - Detail how network provides SSB information of target satellite to UE for soft satellite switching and optionally for hard satellite switch.
  + Remaining details of RACH-less HO
    - Discuss the support of the time-based CHO via RACH-less HO for both configured and dynamic grant
    - Discuss the single split out RACH-less MAC CR for NTN and IAB
  + Remaining details on CHO enhancements
    - Discuss on the information included in CHO configuration for location-based CHO for Earth-moving cells

# Conclusions

**Proposal: RAN2 to consider this list of remaining issues for the next meeting contributions.**

# References

1. RP-232669 Revised WID: NR NTN (Non-Terrestrial Networks) enhancements THALES Rel-18 NR\_NTN\_enh-Core
2. R2-2311273 Report from Break-Out Session on NR NTN and IoT NTN Session chair (ZTE)
3. R2-2311324 LS on NW verified UE location failure during cell change Qualcomm Incorporated LS Out To: RAN3 Rel-18 NR\_NTN\_enh-Core