

3GPP TSG RAN Rel-19 workshop

Taipei, June 15 - 16, 2023

Agenda item: 5. Specific RAN1/2/3-led Rel-19 topics

RWS-230142

# Further NTN enhancement

NEC

# Background

- ◆ In Rel-17, basic functions of NR NTN (Non-Terrestrial Network) and IoT NTN were introduced for Including satellites as part of the 3GPP specifications, based on transparent mode
- ◆ In Rel-18, enhancements for NR NTN and IoT NTN have been discussed and specified:
  - NTN-NTN Mobility with reduce signaling overhead
  - NTN-TN idle mode mobility with less Power consumption.
  - Uplink coverage enhancement
  - Better support discontinuous coverage
  - GNSS fix during connection
  - Location verification
  - Etc.
- ◆ On top of functions (to be) introduced in Rel-17 and Rel-18, Rel-19 can continue further enhancement to consolidate the basic functions including mobility, RRC connection management, supporting discontinuous coverage, etc.

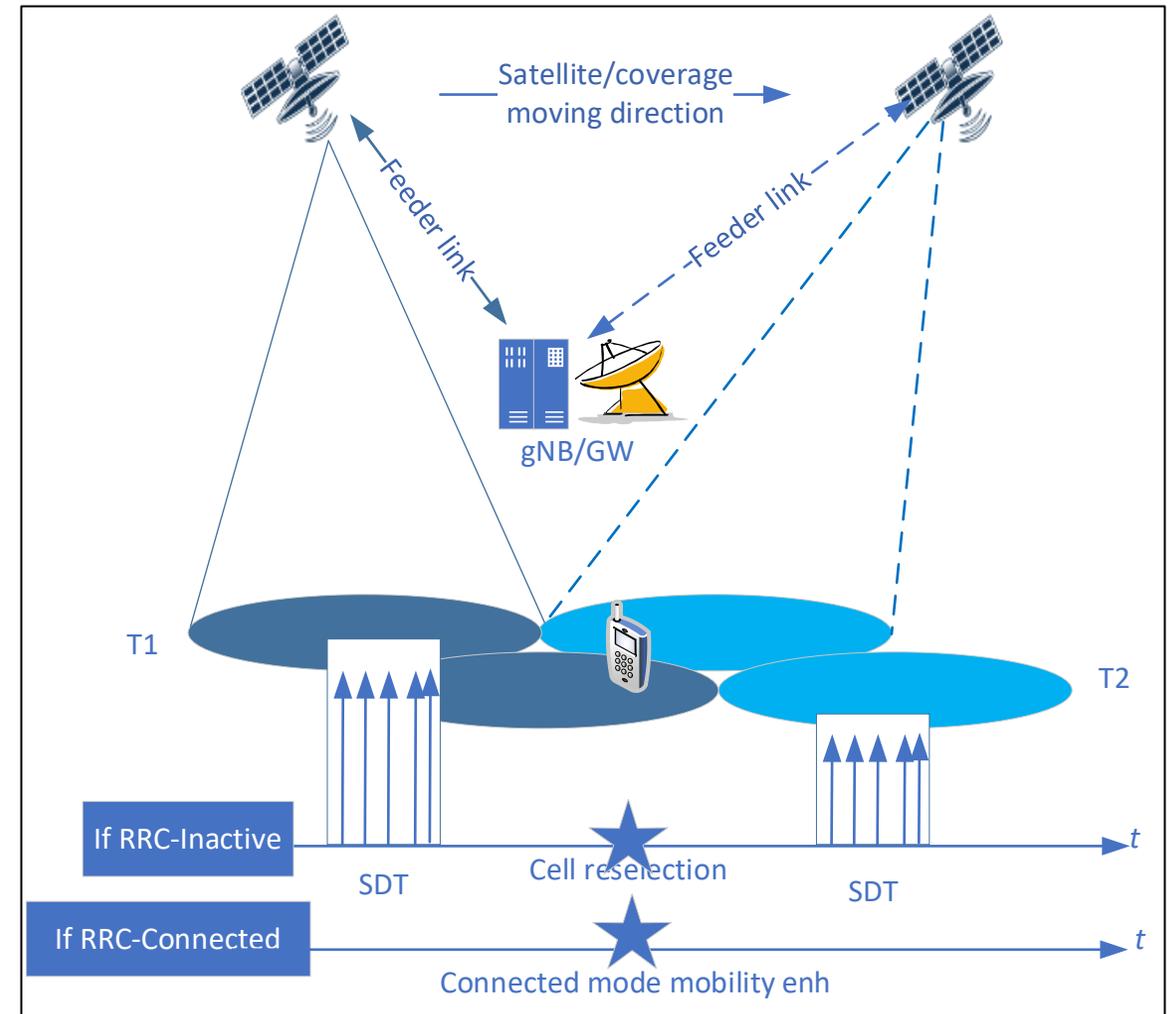
# Further NR NTN enhancement in Rel-19 (1/2)

## ◆ Enhancements to support RRC\_Inactive mode:

- Motivation: RRC-inactive mode is supported in NTN since Rel17, but without much discussion and specification change in Rel-17 due to limit time. RRC-inactive mode is beneficial for NTN scenario comparing to normal RRC connection establishment/handover with regarding shorter delay and less signalling overhead.
- Objective: Study and, if needed, specify enhancements to better support mobility, small data transmission in RRC-inactive mode in NTN scenario

## ◆ Further enhancement on Connected mode mobility

- Motivation: 1) LTM specified in Rel18 could be applied to NTN scenario to cope with the very frequent handover existing in earth –moving cell. 2) And any left-over discussion from rel18 can continues in Rel19
- Objective: 1) applicability of LTM into NTN scenario, 2) CHO enhancements if not finished in Rel-18 discussion e.g., subsequent CHO



# Further NR NTN enhancement in Rel-19 (2/2)

## ◆ Further enhancement on power saving in RRC\_idle/inactive mode

- Motivation: only time and location-based measurement initiation were introduced in Rel17 and Rel18, further discuss other possible enhancements;
- Objective: specify low mobility/cell edge- based measurement relaxing in (quasi) earth-fixed scenario, other measurement relaxing in earth moving scenarios

## ◆ Support CA

- Motivation: To support higher data rate and increase overall capacity
- Objective: CA band/carrier combinations, focus on intra satellite and intra-band CA first.

## ◆ Support GNSS-incapable UE

- Motivation: NTN based access can only be provided to UEs that have already acquired GNSS location which limits the coverage of NTN to outdoor UEs
- Objective: specify at least enhancement to PRACH for TA acquisition, e.g., separate PRACH resources for GNSS and non-GNSS UEs

# Further IoT NTN enhancement in Rel19

## ◆ **Enhancement to support PUR/EDT features (IoT NTN)**

- Motivation: PUR and EDT is beneficial for NTN scenario where the connectivity time with one serving cell is short.
- Objective: Study and, if needed, specify enhancements to support PUR/EDT efficiently in NTN scenario

## ◆ **Further enhancement on power saving**

- Motivation: 1) NTN-TN cell (re)selection enhancement introduced in Rel18 NR NTN could be used as baseline for IoT NTN-TN enhancement 2) only time and location-based measurement initiation were introduced in Rel17 and Rel18, further discuss other possible enhancements;
- Objective:
  - 1) specify low mobility/cell edge- based measurement relaxing in (quasi) earth-fixed scenario, other measurement relaxing if any in earth moving scenarios.
  - 2) Specify NTN-TN cell (re)selection enhancement for power saving

## ◆ **Further enhancement on discontinuous coverage**

- Collaborate with SA2 for any enhancement on paging, eDRX, PSM

# Items could be consider in future (e.g. Rel-20)

- ◆ In future, there are still some aspects to be enhanced or extended.
- ◆ Support Regenerative mode:
  - Select one of the architectures studied in TR38.821 to support regenerative satellite.
  - F1/NG interface enhancement if necessary
  - Support inter-satellite link
  - Support store and forward feature
  - Study following aspects:
    - RAN3 architecture enhancements
    - Timing relationships
    - Mobility enhancements
- ◆ Support dual connectivity
  - NTN-NTN:
    - GSO + NGSO : wide coverage and stable connectivity with GSO, more capacity with NGSO
    - NGSO+NGSO: for mobility robustness
  - NTN-TN:
  - Study following aspects:
    - Handling multiple TA values
    - RAN2/RAN3 Protocol enhancements

# Summary

- ◆ Rel-17 NR NTN and IoT NTN and their enhancements in Rel-18 have been very attractive features along with the recent market demands.
- ◆ On top of these, it is proposed to further enhance NR NTN and IoT NTN in Rel-19, with focusing on the following aspects:
  - NR NTN: RRC\_Inactive mode support, Connected mobility enhancement, power saving in Idle/Inactive, CA support , and GNSS-incapable UE support
  - IoT NTN: PUR/EDT support, power saving and enhancement on discontinuous coverage
- ◆ As observed in the previous slides, there are still additional aspects to be considered in future, the WI on further enhancements of NR NTN and IoT NTN is essential in Rel-19.

\ Orchestrating a brighter world

**NEC**