

3GPP TSG RAN Meeting #102

Edinburgh, Scotland, December 11-15, 2023

RP-232983

Agenda Item:

9.1.2.3

Source:

Spreadtrum Communications

Title:

NTN evolution for NR in Rel-19

Document for:

Discussion and decision

In Chair's summary for RAN Rel-19 Package [1], the following potential objectives on NR NTN are provided:

NTN (Non-Terrestrial Networks) evolution - NR WI

References: [RWS-230488](#), [RP-231540](#), [RP-232610](#)

Potential objectives:

- RAN1-centric

- Coverage enhancements for Downlink focusing on which channels & signals (e.g., paging, DL control, etc.) and target (link level), and assess Satellite Beamhopping optimisations (system level)
 - Do we need to study first?
 - Including potential consideration for "Robust Notification/Alert for paging with no modification to SSB, with close coordination with SA2"
- Uplink capacity / throughput enhancement? → Need to be specific of what to be done (e.g., increasing multiplexing capacity beyond the means of spatial-multiplexing?)

- RAN2-centric

- Mobility enhancements, depending on R18 progress (e.g., Cell reselection enhancements from TN to NTN, Handover enhancements, Soft unchanged PCI switch) → all completed?
- Enhanced GNSS Operation for a UE with GNSS capability in RRC_CONNECTED mode when it's out of GNSS coverage

- RAN3-centric

- Regenerative payload with full gNB

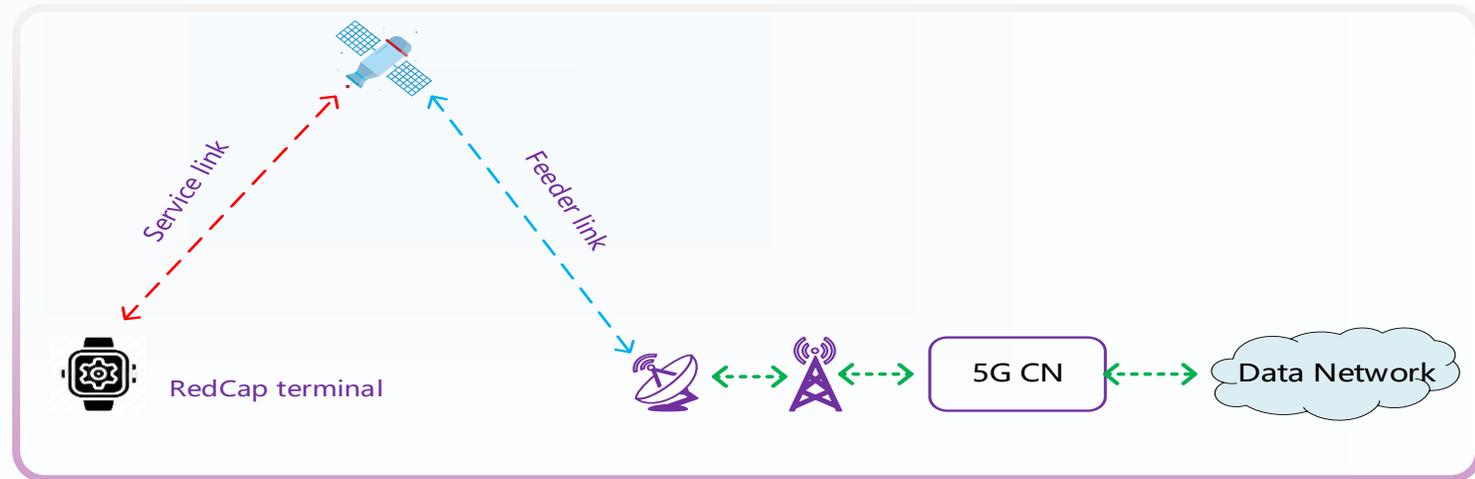
- RAN4-centric

- Coverage enhancements for Uplink focusing on HPUE, Meg5?
 - Should HPUE for NTN be a separate project (led by RAN4)? → to be handled in RAN#10G
- (RAN4 only) REDCAP
 - Focusing on 1R only?
 - Should REDCAP for NTN be a separate project (led by RAN4)?
- ~~MBS via NTN (→) Broadcast-only for NGSC~~

NTN evolution for NR in Rel-19

Motivation

- ❑ The following reference scenario was considered for smartphone access NTN in R18: Parameter set-1 for LEO-1200 satellite operating at Line of Sight (LOS). However, in practice, the transmission power of satellites may be limited. In addition, UE may also be in low SINR environments (e.g., NLOS environments), a more robust channel may be used to notify the end user of MT call/data.
- ❑ RedCap had been specified in R17. RedCap should also be capable of access to NTN due to requirements of global coverage. Regarding NTN for RedCap, the following factors should be considered.
 - Antenna gain loss due to wearable form factor
 - Reduced number of Rx/Tx



Proposal 1: For NR NTN, study and if justified, specify coverage enhancement on DL based on the target link margin gap.

- Including “Robust Notification/Alert”

Proposal 2: Support of NTN for RedCap.

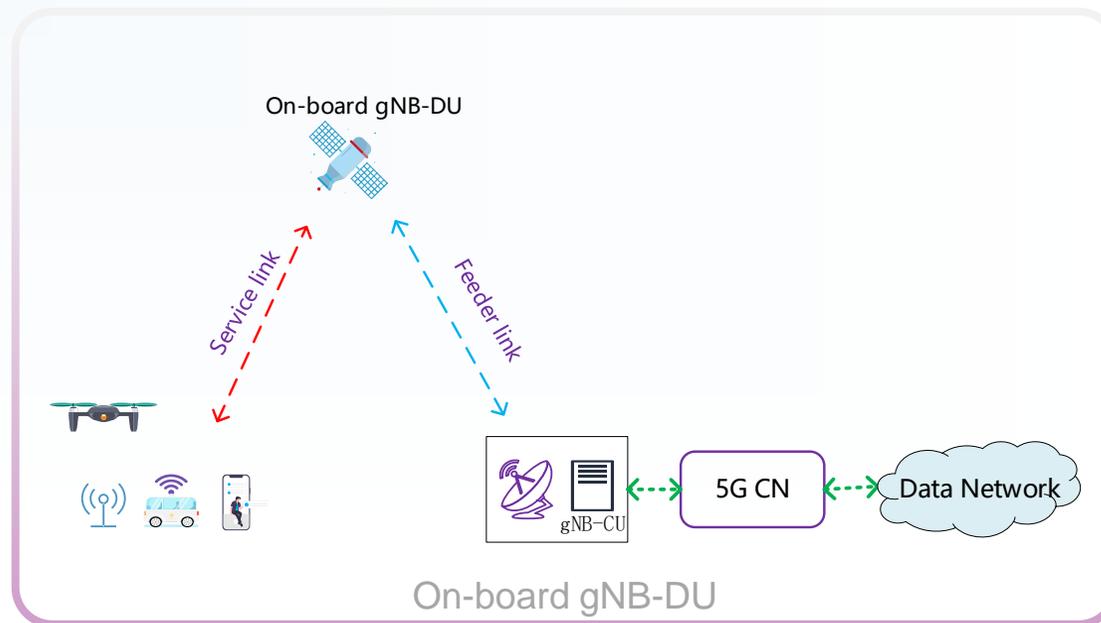
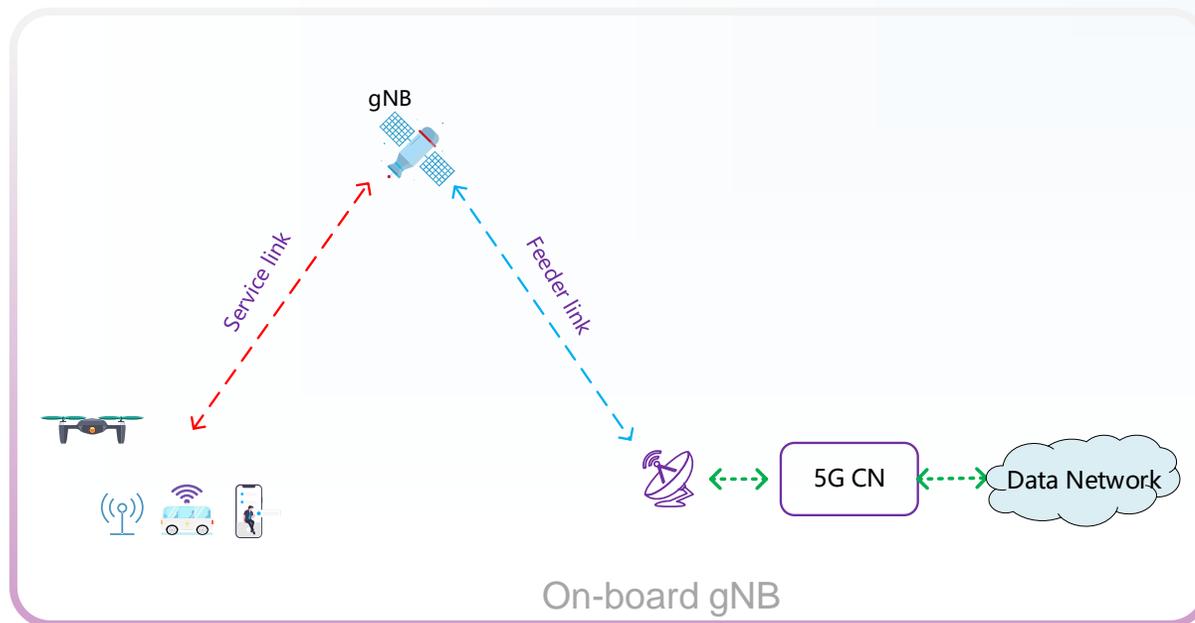
NTN evolution for NR in Rel-19

Motivation

- R17/R18 NTN focuses only on transparent payload. Re-generative payload has following advantages:
 - Reduced latency can be achieved if the gNB is located at satellite.
 - Low dependence on ground network and flexible network deployment.
 - ISL could make the resource coordination between the gNBs more efficient, e.g., handover and other cases.

Proposal 3: Support Re-generative payload.

- Consider the case of full gNB on satellite with/without ISL (inter satellite link).
- Consider the case of split CU-DU, e.g., on-board gNB-DU.

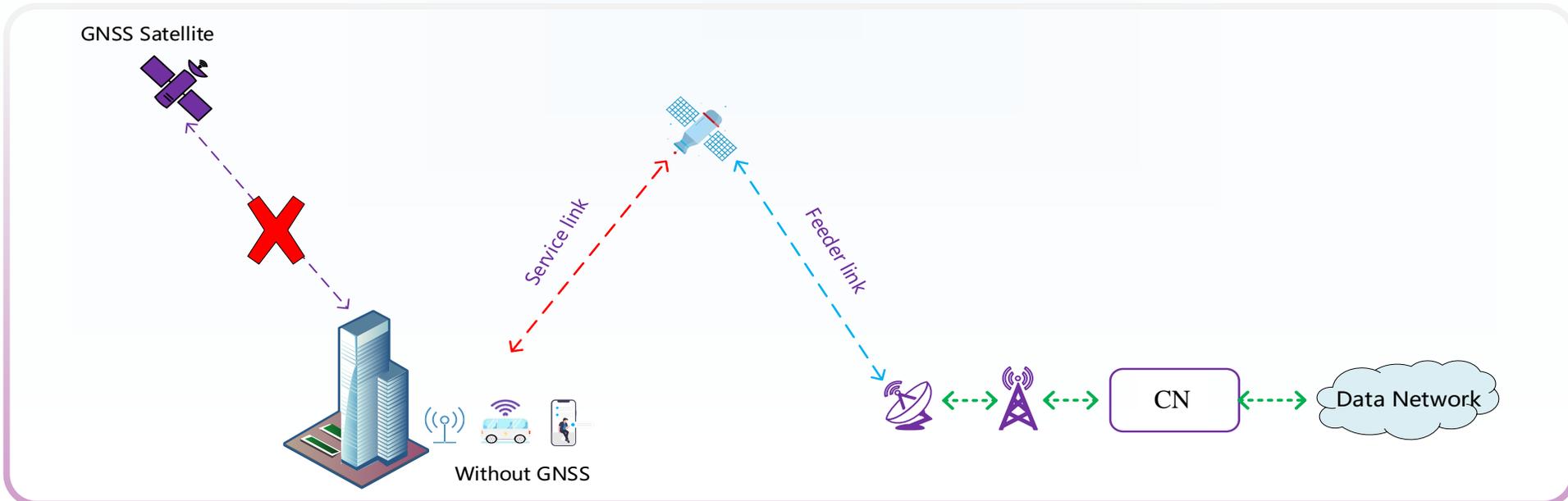


NTN evolution for NR in Rel-19

Motivation

- GNSS capability is one of the UE restrictions in Rel-17/Rel-18 NTN.
 - UE needs to use GNSS position information and ephemeris information to perform time-frequency synchronization.
- However, GNSS jamming (leading to denial of service) and spoofing (leading to incorrect location reporting and potentially denial of service) may occur on a temporary basis.
- GNSS independent operation is one of the use cases in R19 SA1 study.

Proposal 4: Support enhancements on GNSS Operation for UE with GNSS capability in RRC_CONNECTED mode when it's out of GNSS coverage.



NTN evolution for NR in Rel-19

The following objectives should be considered in Rel-19 NR NTN

- **Study and if justified, specify coverage enhancement on DL based on the target link margin gap [RAN1]**
 - Note: Including “Robust Notification/Alert” [RAN1, RAN2]
 - Note: dependence on input from SA2
- **Support of NTN for RedCap [RAN4, RAN1]**
- **Support Re-generative payload [RAN3, RAN2]**
 - At least support the case of full gNB on satellite with/without ISL (inter satellite link)
- **Support enhancements on GNSS Operation for UE with GNSS capability in RRC_CONNECTED mode when it's out of GNSS coverage [RAN2, RAN1]**
 - Including enhanced uplink time-frequency synchronization mechanism in RRC_CONNECTED mode

Thanks

