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# Enhancements on NTN for 5G Advanced



# Background of NTN in 3GPP

- The 5G enabled NTN network has been studied in previous release with corresponding specification on NR-NTN [RP-211557] and IoT-NTN [RP-211601] in Rel-17.
- According to the extensive discussion in RAN Rel-18 workshop, NTN evolution (NR & IoT) has been identified as one potential area and the HAPS is categorized in additional set
  - The convergence on the scope for each topic is still lower after the pre-meeting discussion
- Regarding NTN in Rel-18, in our view:
  - Leftovers in Rel-17 should be prioritized since all these aspects have been considered as necessary feature in previous study but failed to be supported, e.g., due to TU restriction, especially for IoT-NTN
  - Essential features should be considered to enable more general applicable scenarios for NTN should also be prioritized to boost the eco-system, e.g.,
    - Density and power consumption for IoT scenario
    - Coverage enhancement for handheld UE and throughput improvement for VSAT/Other UEs type
    - Relaxed assumption on UE's capability on GNSS
  - Extensive evaluation and justification other features should be considered including potential impacts on the implementation

# Potential objectives for NR-NTN

- Specify the following leftovers in NR-NTN
  - TN-NTN mobility enhancement and service continuity [RAN2]
  - Beam management [RAN1]
- Study on following aspects to extend the applicable scenarios
  - UL synchronization enhancement with consideration on GNSS capable UE with poor position accuracy (1<sup>st</sup> priority) and GNSS-incapable UE (2<sup>nd</sup> priority) [RAN1]
  - UL-oriental evaluation for handheld UE, including PRACH and PUSCH (e.g., for VoNR-NTN) [RAN1,RAN2]
  - DL-oriental performance improvement VSAT/Other UE to address the CSI-aging and reduce the DM-RS density [RAN1]
  - NTN-NTN multi-connectivity in co-orbit cases, e.g., LEO-LEO [RAN1, RAN2]
  - Regenerative payload related enhancement with only full-gNB on board [RAN2, [RAN3]]
  - HAPS related enhancement with consideration on:
    - Typical scenario identification [RAN1]
    - TDD application [RAN1/RAN4]
    - co-channel interference [RAN4]
- Other aspects can be deprioritized, e.g., network-based UE location, PAPR reduction (without new waveform)

Note: No support on MBS-NTN and Redcap-NTN in Rel-18

# Potential objectives for IoT-NTN

- Specify the enhancement on following aspects with potential study phase:
  - UL synchronization for IoT device with long transmission [RAN1]
    - Mechanism on satellite ephemeris/common TA related parameters acquisition
    - Optimization on GNSS fix and power reduction
  - HARQ disabling to mitigate the impact of HARQ stalling with NR solution as baseline [RAN1,RAN2]
  - PRACH enhancement to improve the supported UE density and RACH congestion reduction [RAN1, RAN2]
  - Power saving enhancement, e.g., area specific SI acquisition [RAN2]
  - Further enhancement on mobility
    - Neighbor cell measurements and corresponding measurement triggering before RLF [RAN2]
    - Beam-level mobility [RAN2, RAN1]
  - Further enhancement on discontinuous coverage
    - Power saving enhancement including efficient eDRX/PSM and PUR for sparse satellite constellations. [RAN2, RAN3]
    - Enhancements on RLF and RRC reestablishment[RAN2]

Note: No support on re-generative alike enhancement in IoT-NTN

# Thanks



Tomorrow never waits

