3GPPTSG RAN Meeting #101
Bangalore, India, September 11-15, 2023
Agenda Item: 8A.2.7

RP-232582

NTN Enhancement topic prioritization for Rel 19

Sourced by: CEWiT, IITK, IITH, IITM

Categorization of topics based on WS contributions

- AI/ML Air Interface
- MIMO Evolution
- Duplex Evolution
- Ambient IoT
- Network Energy Saving Enhancements
- Mobility Enhancements
- NTN Evolution
- XR Evolution
- AI/ML for NG-RAN
- SON/MDT
- Channel Modeling (& possibly additional aspects e.g., for ISAC) for further evolution

This contribution discusses our NTN Enhancement priorities for Rel 19.

- Additional RAN1-led Candidate Topics
  - LP-WUS/WUR
  - Multi-carrier Enhancements
  - Coverage Enhancements
  - Positioning Enhancements
  - SL Evolution
- Additional RAN2-led Candidate Topics
  - NCR
  - SL Relay Enhancements
  - UAV/UAM
  - MU-SIM
  - Broadcast/multicast
  - UE aggregation, collaboration, and backup
- Additional RAN3-led Candidate Topics
  - Topological enhancements
    - IAB/WAB/Femto
    - E.g.., for public safety/emergency services
  - QoE
- Others
  - Lean protocol stack/High-speed packetization/Layer 2 UP enhancements
  - RAN architectural enhancements/AS Security Enhancements
  - Network/Outer coding
  - RedCap Enh./High reliability and low complexity IoT
    - Combination w/ SL or NTN can be discussed in the SL/NTN topics, respectively)
  - TaaS (Timing as a service)/High Accuracy Timing Service
  - SDT enhancements
  - LTE enhancements
  - Dynamic UE capability update
  - Others (e.g., Idle/Inactive enhancements, RAN slicing enhancements, etc.)

Source: RWS-230488

NTN Enhancement Priority 1: Regenerative Payload

- Network Controlled Repeater (NCR)
  - Less complex solution among all with leveraging current transferent payload architecture with necessary control over access link at the payload.
  - The NCR can form a beam towards the intended receiver and can forward the signal towards it. Therefore, the beamforming improves the signal strength at the intended receiver.
  - Enhancing the coverage by providing service to the coverage holes.
  - Beamforming capability at the NCR can improve communication through the repeater and can reduce interference from NCR to other nodes in the network.
- Full gNB + part of the core network (CN):
  - Loopback connectivity like UE-Payload-UE link without going to the ground station based on SA1 use cases.
  - Connectivity in the absence of a satellite gateway.
  - **Note that the CN part will be decided by SA2.**
- DU on board
  - Improves spectral efficiency of the feeder link
  - Control plane latency reduction
  - Limit the bandwidth of the backhaul between the satellite and the ground station.

NTN Enhancement Priority 2: DL coverage

- A satellite has constraints on both transmission power and feeder link bandwidth
- It may not be possible to activate all the beams with nominal EIRP density [38.821]
- DL coverage enhancements:
  - To maximise the number of beams that can be activated simultaneously through EIRP reduction compared to the nominal EIRP density per beam.
  - All user terminals can be served across the satellite footprint through dynamic power sharing between beams or different beam patterns/sizes
  - Determine target link margin for different DL channels and percentage of active beams.

NTN Enhancement Priority 3: NTN/TN mobility

- Use case:
  - Automotive/Transport users
- NTN (LEO, MEO or GEO) to TN mobility, or vice versa in connected mode to ensure the service continuity.
- Mobility of Delay sensitive (TN to LEO) and delay insensitive (TN to GEO) application.
- Conditional handover procedure e.g. location-based

NTN Enhancement Proposals

- In Rel 19 NTN enhancement, the Support of Regenerative payloads for NR should be considered.
  - Consider payload as
    - Network control repeater (NCR) type
    - DU type
    - Full gNB (CU+DU) type
- In Rel 19 NTN enhancement, the DL Coverage enhancements should be considered.
  - A study item followed by a work item should be defined
    - Consider practical scenarios and parameters to derive the conclusion of study item.
  - Identify which physical channels need to be enhanced and corresponding enhancements.
  - Identify the maximum simultaneously available beam for desired link gain.
- In Rel 19 NTN enhancement, the NTN/TN Mobility enhancement in connected mode for NR should be considered.
  - Define the conditional hand-over procedure between both NTN and TN access links.

THANK YOU

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