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Agenda Item: 8A.2.13.1
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Views on enhanced NCR in Rel-19

Background

- In Rel-18, Network-Controlled Repeater (NCR) was introduced as a cost effective way to improve the network coverage.
- Based on TR 38.867 [1], the scope of Rel-18 NCR is limited to the following scenarios and assumptions:
  - Network-controlled repeaters are inband RF repeaters used for extension of network coverage on FR1 and FR2 bands, while during the study FR2 deployments may be prioritized for both outdoor and O2I scenarios.
  - For only single hop stationary network-controlled repeaters
  - Network-controlled repeaters are transparent to UEs
  - Network-controlled repeater can maintain the gNB-repeater link and repeater-UE link simultaneously

Potential direction for enh. NCR (1/3)

- Out-of-band NCR
  - In Rel-18, only in-band is supported where at least one of the NCR-MT's carrier(s) should operate in the frequency band forwarded by the NCR-Fwd. Therefore the same large-scale properties of the channel are expected to be experienced by C-link and backhaul link.
  - In Rel-19, it is necessary to consider the out-of-band scenarios which can provide a robust C-link connection. The following scenarios can be considered as a starting point.
    - Scenario 1: C-link in FR1, Fwd-link in FR2.
    - Scenario 2: C-link and Fwd-link are in different carriers, within the same band.
    - Scenario 3: C-link and Fwd-link are in different band, but the same frequency range.
  - Proposal 1: The out-of-band scenario is introduced for Rel-19 NCR.

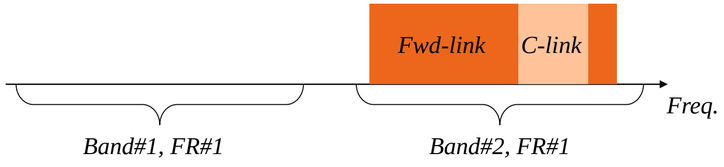

Fig.1 R18 inband

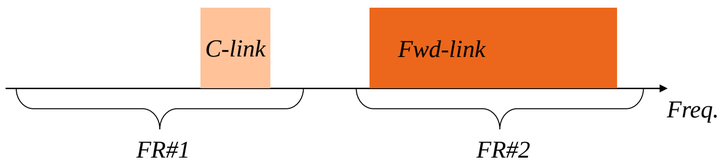

Fig.2 R19 out-of-band scenario 1

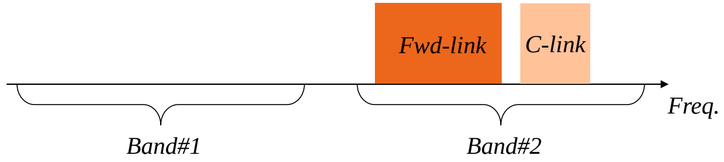

Fig.3 R19 out-of-band scenario 2

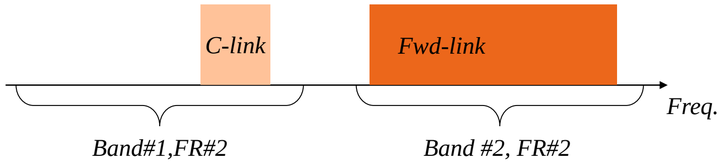

Fig.4 R19 out-of-band scenario 3

Potential direction for enh. NCR (2/3)

- Advanced beam indication
  - In Rel-18, periodic, semi-static and aperiodic beam indication are supported for access link beam indication. And single beam at a specific time is assumed, priority flag and priority rules are introduced to avoid beam indication confliction.
  - In Rel-19, it is necessary to consider NCR capable of transmitting different beams in the overlapping time resources, which can increase the system spectrum efficiency. The following two cases can be considered:
    - Case 1: Multi-beam indication at overlapping time resource and same frequency resource
    - Case 2: Multi-beam indication at overlapping time resource but different frequency resource
  - Proposal 2: Advanced beam indication is introduced for Rel-19 NCR.

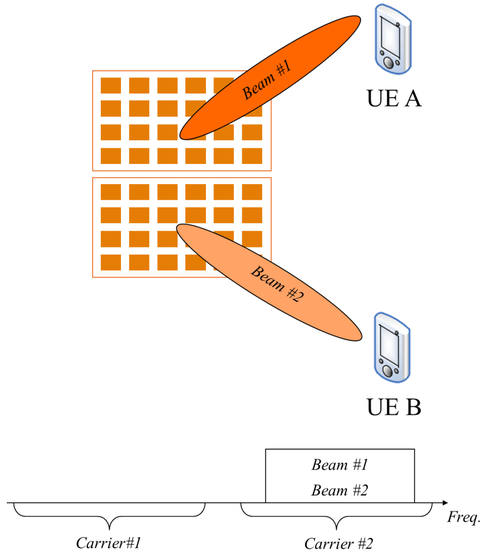

Fig.1 multi-beam indication in the same T/F resource

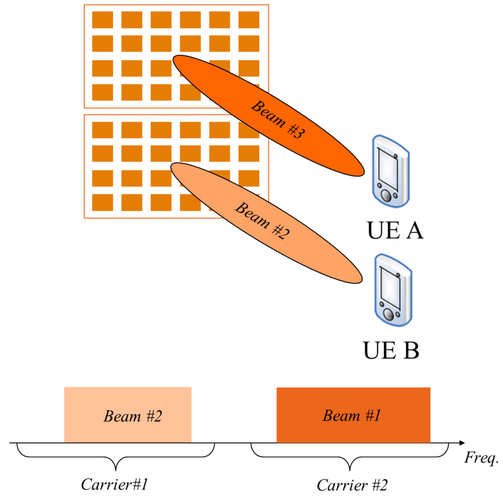

Fig.2 multi-beam indication in the different T/F resource

Potential direction for enh. NCR (3/3)

- Mobile NCR
  - In Rel-18, NCR node is stationary. Handover and its related features (e.g., CHO, DAPS, CPAC, etc.) are not supported by NCR-MT.
  - In Rel-19, it is necessary to consider mobile NCR (e.g. mounted on vehicle) to provide enhanced coverage. Such mobility for NCR can handle the dynamic traffic distribution in the network deployment.
    - To minimize standardization impact, only mobility within gNB-CU is considered.
  - Proposal 3: RRM measurement in RRC_CONNECTED and mobility for NCR-MT within gNB-CU are introduced for Rel-19 NCR.

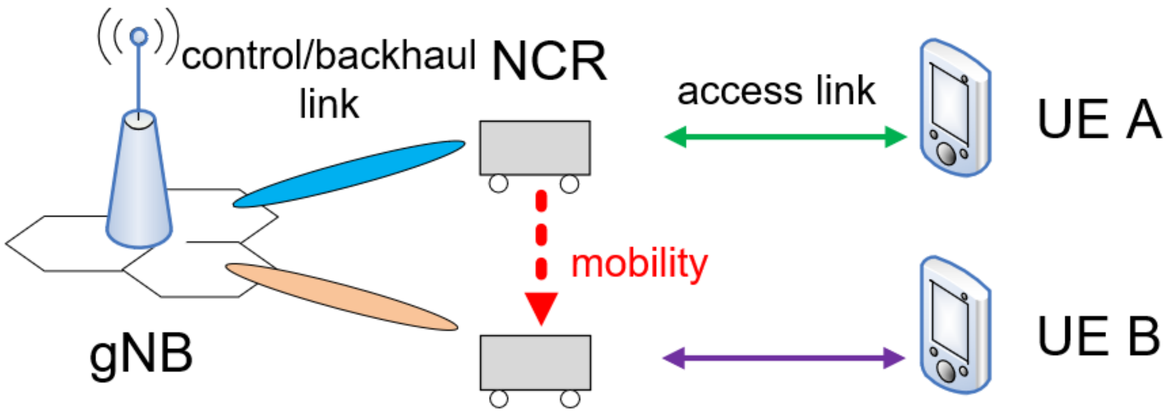

Fig.1 Mobile NCR

Summary

- Proposals of enhanced NCR for Rel-19.
  - Proposal 1: The out-of-band scenario is introduced for Rel-19 NCR
  - Proposal 2: Advanced beam indication is introduced for Rel-19 NCR.
  - Proposal 3: RRM measurement in RRC_CONNECTED and mobility for NCR-MT within gNB-CU are introduced for Rel-19 NCR.

Reference

[1] 3GPP TR 38.867 V18.0.0 (2022-09)

Thank you