

3GPP TSG RAN Rel-19 workshop

RWS-230140

Taipei, June 15 - 16, 2023

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

# Network-controlled Repeater (NCR) Evolution

NEC

# Background

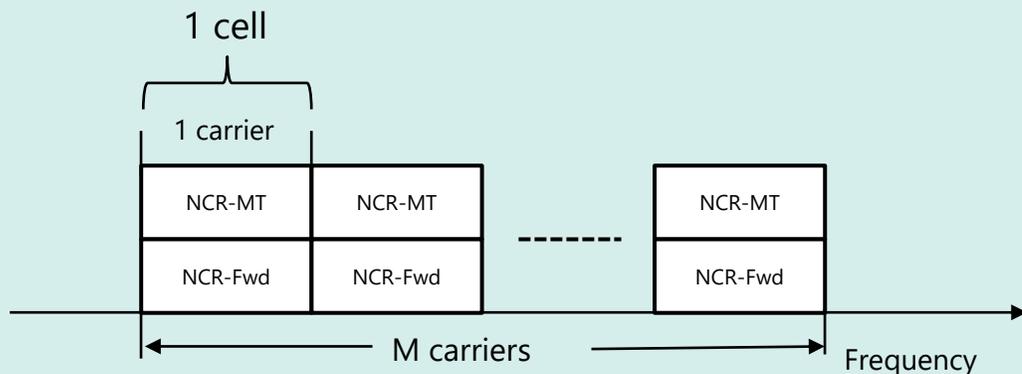
- ◆ To further increase operators' flexibility for their network deployments, Rel-18 introduced a network-controlled repeater (NCR) which is an enhancement over conventional RF repeaters with the capability to receive and process **side control information** from the network.
  - Side control information could allow a network-controlled repeater to perform its amplify-and-forward operation in a more efficient manner.
  - Potential benefits could include mitigation of unnecessary noise amplification, transmissions and receptions with better spatial directivity, and simplified network integration.
- ◆ However, Rel-18 NCR can only be applied for following limited objectives
  - inband RF repeaters
  - for only single hop
  - stationary
  - without power control side control information

# Potential direction of Rel-19 NCR Evolution (1/3)

Evolutions for supporting intra-band contiguous multiple carriers and dynamic control of NCR-Fwd forwarding bandwidth

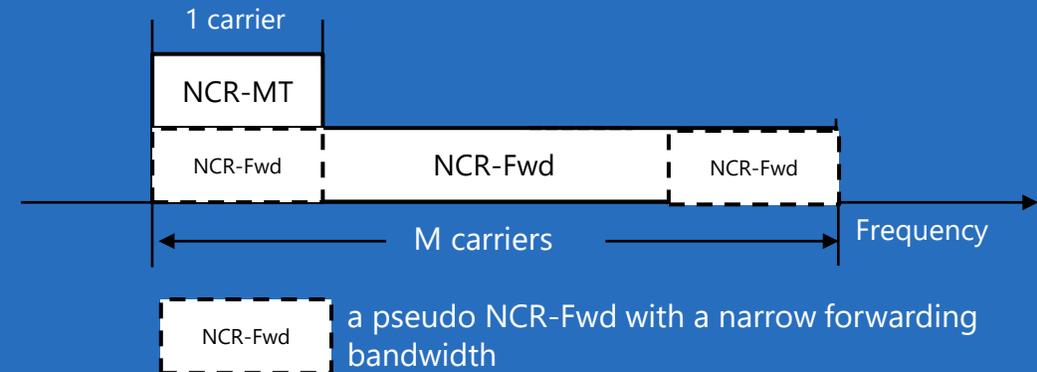
## Rel-18

- ◆ For supporting contiguous  $M$  carriers,  $M$  Rel-18 NCRs each contains 1 NCR-MT and 1 NCR-Fwd are needed
  - Rel-18 NCR is an inband repeater, i.e., NCR-MT, NCR-Fwd shall operated in the same band (the same carrier)
- ◆ Drawbacks: less efficiency due to unnecessary multiple NCR-MTs and narrow passband support of NCR-Fwd



## Rel-19

- ◆ 1 NCR-MT operated in a single carrier to control an NCR-Fwd supporting intra-band contiguous  $M$  carriers



- Support dynamic control of NCR-Fwd forwarding bandwidth to mitigate interference and achieve the NCR energy saving

# Potential direction of Rel-19 NCR Evolution (2/3)

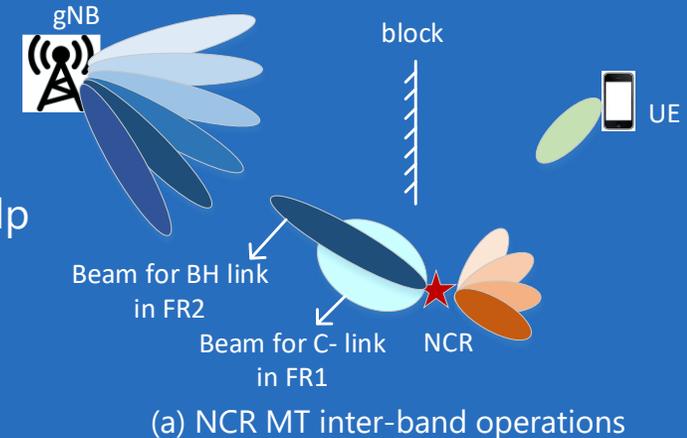
## Evolutions for supporting robust side control information exchange via inter-band operations

### Rel-18

- ◆ NCR-MT and NCR-Fwd operate at the same band and may share the same antenna panel
- ◆ Potential drawbacks:
  - Restrict the backhaul link beam to the same with control link in the time domain resource with simultaneous downlink reception or uplink transmission in control link and backhaul link
  - Control link and backhaul link may experience a similar poor radio conditions which result in a slow recovery procedure

### Rel-19

- ◆ Provide a robust side control information exchange via inter-band operations of NCR-MT to help backhaul link recovery faster
  - keep measuring backhaul/control link quality by NCR-MT
- ◆ Distributed NCR-Fwd deployments with a single NCR-MT
  - multiple NCR-Fwd can be controlled independently to cover different floors/areas/coverage holes



# Potential direction of Rel-19 NCR Evolution (3/3)

## Evolutions for supporting mobile NCR and power control side control information

### Rel-18

- ◆ Only stationary NCR is supported
- ◆ Power control side control information is not supported

### Rel-19

- ◆ Support of mobile NCR
  - Focus on the scenario of mobile NCR mounted on vehicles providing 5G coverage/capacity enhancement to onboard and/or surrounding UEs.
  - Procedures for migration/topology adaptation to enable NCR mobility, enhancements for mobility of an NCR together with the served UEs, etc.
- ◆ Support of power control side control information
  - Specify the signaling of the power control side control information for access link/backhaul link (Rel-18 leftover topic)
  - Specify the power allocation between control link and backhaul link when simultaneous UL transmission occurs.

# Summary

## NCR evolution as one of major features in Rel-19

- ◆ It is proposed to support;
  - intra-band contiguous multiple carriers and dynamic control of NCR-Fwd forwarding bandwidth
  - robust side control information exchange via inter-band operations
  - mobile NCR
  - power control side control information

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