3GPP TSG-RAN WG2 Meeting #120 R2-2213009

Toulouse, France, November, 2022

Source: Session Chair (Apple)

Title: Report from NC Repeater breakout session

# Status of At-Meeting Email Discussions

This subclause is not an Agenda Item. It contains a running summary of the email discussions assigned to take place during the meeting weeks. This section will be moved to an appendix in the final version of the report.

* [AT120][700][NCR] Organisational Sasha – NCR (Apple)

Scope: Organisational discussions and announcements, as needed throughout the meeting weeks

Intended outcome: Well-informed participants

Deadline: Friday 2022-11-25 1700

## 8.1 NR network-controlled repeaters

(NR\_NetConRepeater; leading WG: RAN1; REL-18; WID: [RP-222673)](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/RP-222673).zip)

Time budget: 0.5 TU

Tdoc Limitation: 2 tdocs

### 8.1.1 Organizational

Including LSs and any rapporteur inputs.

Note: LS [R2-2211173](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211173.zip) is moved to AI 8.1.3.

### 8.1.2 Signalling for side control information

Signalling and procedures for for side control information, based on RAN1 agreements. Additionally, any other RAN2 reletated aspects, if needed.

Note: the following documents will be discussed online.

[R2-2211908](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211908.zip) Consideration on NCR open issues ZTE Corporation, Sanechips discussion Rel-18 NR\_netcon\_repeater Late

Proposal 1: NCR-MT can optionally support RRC\_INACTIVE state with the assumption that enhancement specifically for NCR-MT is not needed.

Proposal 2: NCR-MT can indicate a maximum number of supported DRBs as part of UE capability.

Proposal 3: NCR-MT can indicate whether it supports SRB2 configuration without DRB.

Proposal 4: NCR-MT should mandatorily support SSB based RLM.

Proposal 5: For FR2, NCR-MT should mandatorily support SSB based BFD and BFR.

Proposal 6: NCR-MT can optionally support cell (re)selection and handover.

Proposal 7: NCR-MT can optionally support RRM measurements in RRC\_IDLE/INACTIVE and in RRC\_CONNECTED.

Proposal 8: The capabilities of NCR-MT and the capabilities of NCR-Fwd are reported separately to the gNB.

Proposal 9: RAN2 should focus on mandatory features that are supported by NCR-MT, all optional features are by default applicable to NCR-MT unless explicitly excluded.

Chair: do we discuss all the features one by one or take a “generic” approach?

Proposal 10: RAN2 to discuss NCR-MT features based on above tables and capture the conclusion in TS 38.306.

[R2-2211198](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211198.zip) Further discussion on the necessary aspects to support NCR Huawei, HiSilicon discussion Rel-18 NR\_netcon\_repeater

Proposal 1: RAN2 to inform RAN1 that RRC signaling is recommended if the side control information is semi-static or requires higher reliability.

Proposal 2: RRC\_INACTIVE is not supported for NCR-MT.

Proposal 3: The NCR-Fwd should be in OFF state when the NCR-MT is in RRC\_IDLE.

Proposal 4: NCR-MT ignores cellReservedForOtherUse for cell barring determination, but the NPN capable NCR-MT should consider cellReservedForOtherUse for determination of an NPN-only cell.

Proposal 5: Introduce an NCR-support indication in SIB1.

Proposal 6: Send an LS to ask RAN1 which of the features are applicable to NCR, and whether they are mandatory or optional.

Proposal 7: Cell re-selection and RRM measurements in RRC\_IDLE are supported as mandatory.

Proposal 8: HO and RRM measurements in RRC\_CONNECTED are not supported.

Proposal 9: The maximum number of DRB can be discussed during the capability phase.

[R2-2212492](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212492.zip) Discussion on signalling aspects for NCR Ericsson discussion Rel-18 NR\_netcon\_repeater

Proposal 1 When NCR-Fwd is ON, NCR-MT can be in any RRC states.

Proposal 2 RAN2 to work on mechanisms to separately control NCR-Fwd ON/OFF states and NCR-MT RRC states.

Proposal 3 Introduce an optional 1-bit indication in SIB1 to signal NCR support. FFS on whether this should also be done for NPNs.

Proposal 4 The NCR-MT does not support the RRC\_INACTIVE state.

Proposal 5 The NCR-MT shall support at most 1 DRB.

DISCUSSION

**NCR support in SIB:**

(R2-2211198) Proposal 5: Introduce an NCR-support indication in SIB1.

(R2-2212492) Proposal 3: Introduce an optional 1-bit indication in SIB1 to signal NCR support. FFS on whether this should also be done for NPNs

ZTE, Mediatek, Fujitsu**:** we support this

Fujitsu: but not NPN

LG: support, and it should be per-PLMN as in IAB to support RAN sharing; in IAB it is also per NPN

Intel: this bit is only indicating that MT can connect to gNB, it does not say anything about FWD. The relationship between MT and FRD is not clear.

Chair: I suggest to discuss these details offline

ZTE: it can be per PLMN

QCOM: we agree, should be the same as in IAB. This should indicate that the parent support NCR operation.

Huawei: we agree it should as IAB

* Introduce an NCR-support indication in SIB1 per PLMN; whether it is also per NPN is FFS

**RRC\_INACTIVE:**

(R2-2211908) Proposal 1: NCR-MT can optionally support RRC\_INACTIVE state with the assumption that enhancement specifically for NCR-MT is not needed.

(R2-2211198) Proposal 2: RRC\_INACTIVE is not supported for NCR-MT.

(R2-2212492) Proposal 4 The NCR-MT does not support the RRC\_INACTIVE state.

MediaTek: agree with E///, no need to support INACTIVE

QCOM: it is supposed to be low complexity, but low complexity may mean you re-use “what you have”. It is better to keep it optional.

Apple: disagree with QCOM about complexity. Agree with Mediatek and E///

Samsung: disagree with Apple, support keeping it optional

LG: agree with QCOM; supporting inactive is not a problem but we should also discuss how it relates to ON/OFF

E///: supporting RRC\_INACTIVE requires RAN4 involvement

AT&T: we support QCOM, mirroring IAB is a good model

* WA: RRC\_INACTIVE is optionally supported without any specific enhancements

Apple: does optional support mean we introduce new capability

ZTE: capability is already there

Apple: that would be a different capability

NEC: support the current proposal

Samsung: it is true it is not legacy capability, but we have done something similar in IAB

Intel: we also support the current proposal

**On/Off:**

(R2-2211198) Proposal 3: The NCR-Fwd should be in OFF state when the NCR-MT is in RRC\_IDLE

(R2-2212492) Proposal 1 When NCR-Fwd is ON, NCR-MT can be in any RRC states.

(R2-2212492) Proposal 2 RAN2 to work on mechanisms to separately control NCR-Fwd ON/OFF states and NCR-MT RRC states.

E///, MediaTek, Samsung, Apple, ZTE, Intel, QCOM: agree with E///, that ON/OFF and RRC states should be decoupled

Nokia: we have symphony with this, but wonder if it RAN1 decisions would impact this

Huawei: what is meant by “decoupled”? In Idle there would be no network control, so we need to discuss those details

QCOM: even if it is in idle it can operate, but of course the network would not have immediate control

E///: “independent” instead of “decoupled”; open to discuss details

LG: better wording is “When NCR-Fwd is ON, NCR-MT can be in any RRC states”

Kyocera: agree with HW, NCR-MT is normally in connected

ZTE: this has been discussed in RAN1, and RAN1 agreed FWD can work in any state

* Continue offline

**Max number of DRBs:**

(R2-2211908) Proposal 2: NCR-MT can indicate a maximum number of supported DRBs as part of UE capability.

(R2-2211198) Proposal 9: The maximum number of DRB can be discussed during the capability phase.

(R2-2212492) Proposal 5: The NCR-MT shall support at most 1 DRB.

QCOM, LG, Samsung: no reason to have any restrictions, should be up to implementation

MediaTek, Apple: at most 1, only for OAM

ZTE: our proposal was capability, but we are OK with 1 DRB

HW: there can be multiple traffic flows from OAM, should discuss further

CMCC: at least 1 DRB should be supported, define capability

Nokia: in the future we may need more than 1, same view as LG

QCOM: restricting to 1 means more effrot

* Continue offline

**Cell (re)selection and handover:**

(R2-2211908) Proposal 6: NCR-MT can optionally support cell (re)selection and handover.

(R2-2211908) Proposal 7: NCR-MT can optionally support RRM measurements in RRC\_IDLE/INACTIVE and in RRC\_CONNECTED.

(R2-2211198) Proposal 7: Cell re-selection and RRM measurements in RRC\_IDLE are supported as mandatory.

(R2-2211198) Proposal 8: HO and RRM measurements in RRC\_CONNECTED are not supported.

LG: Removing cell reselection will have big spec impact; safer to support reselection

Intel: we haven’t discuss the relationship between MT and FWD, what reselection of MT means for FWD?

Intel: can NCR-MT and NCR-FWD cells be different?

Vivo: cell reselection should be supported, but not HO

AT&T, QCOM: NCR may be stationary but they mobility should be supported

ZTE: response to Intel: NCR-MT is connected to a specific cell but FWD will amplify all the cells on the frequency; in this discussion cell reselection is for NCR-MT

E///, QCOM: cell (re)selection and HO go “hand in hand”

Nokia: support cell (re)selection but not necessarily HO

* Continue offline
* [AT120][701][Follow up on discussions] (ZTE)

Scope:

* Further details of the agreed proposals
* All the proposals which have not concluded online
* Can also discuss other proposals from the papers treated online

Intended outcome: summary for the online CB session with hopefully agreeable proposals

Deadline: CB session

**NCR-MT capabilities:**

(R2-2211908) Proposal 10: RAN2 to discuss NCR-MT features based on above tables and capture the conclusion in TS 38.306.

Chair: Long email discussion between the meetings for capablities?

HW: too early

Note: the following document will be discussed online if time permits.

[R2-2212309](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212309.zip) Signalling for NCR side control information MediaTek Inc. discussion Rel-18

Proposal 1: The configuration for receiving the side control information signalling is indicated in RRC

Proposal 2: RAN2 to use RRC for semi-static beam information, MAC CE for dynamic beam information.

Proposal 3: RAN2 to use MAC CE for timing information.

Proposal 4: RAN2 to use RRC message for UL-DL TDD configuration.

Proposal 5: RAN2 to use RRC message to configure ON-OFF information (i.e., DRX-like mechanism).

DISCUSSION

*Note: this paper was not discussed due to lack of time*

[R2-2213061](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Inbox/R2-2213061.zip) Report of [AT120][701][NCR] Follow up on discussions (ZTE)

Proposal 0 The cell that NCR-Fwd is forwarding is the same cell the NCT-MT is connected to.

Note: whether the NCR-Fwd can forward other cells is up to implementation.

QCOM: support the proposal and suggest to make the note part of it.

NEC: support the intention but wonder how the “cell of FwD” is defined?

Samsung: there is no “NCR-Fwd cell” per se

Proposal 1 NCR-MT indicates the maximum number of supported DRB in UE capability, value range {1, 16}. If absence, the NCR-MT does not support DRB.

AT&T: there is a typo

Proposal 2 SRB2 is mandatory feature for NCR-MT.

Proposal 3 On NCR-Fwd ON/OFF:

* When NCR-MT is in RRC\_CONNECTED mode, the NCR-Fwd can be ON or OFF following the side control information received from the gNB.
* After NCR-MT enters RRC\_INACTIVE mode, the NCR-Fwd can be ON or OFF following the last configuration received from the gNB.
* After NCR-MT enters RRC\_IDLE mode upon RRC Release, the NCR-Fwd can be ON or OFF following the last configuration received from the gNB.
  + FFS we specify a mechanism to trigger the NCR-MT back to RRC\_CONNECTED mode.

Huawei: there may be a problem when gNB releases NCR-MT to idle, it may not be able to page it to bring it back to CONNECTED. Suggest FFS for 3rd bullet.

ZTE: understand HW’s concern, however we already agreed that IDLE is supported. How to bring NCr-MT back to connected is FFS and will be addressed.

Samsung: agree with ZTE

Intel: agree with Samsung, we can “fix” this by rewording “if IDLE is supported”

HW: not clear why would gNB release NCR-MT to idle

ZTE: use case confirmed by RAN1

Proposal 4 On NCR-MT RLF:

* After RLF is declared by NCR-MT, NCR-MT can perform cell selection and trigger RRC re-establishment;
* If NCR-MT enters RRC\_IDLE due to no suitable cell is find, NCR-Fwd is OFF;
* During RRC re-establishment procedure, NCR-Fwd is OFF.

LG: whether NCR-Fwd is OFF when there is no suitable cell should be left to implementation

Samsung: wouldn’t this cause interference? We prefer to specify it

Nokia, ZTE, QCOM: agree with Samsung

Proposal 5 NCR-MT mandatorily support cell reselection and RRM measurements in RRC\_IDLE and RRC\_INACTIVE.

Proposal 6 In Rel-18, NCR-MT does not support handover and RRM measurements in RRC\_CONNECTED.

BT: how we plan to do beam management?

E///: for beam management it is RLM, the proposal (RRM) is for mobility

Proposal 7 For reporting the capabilities of NCR-MT, the existing *UECapabilityEnquiry* and *UECapabilityInformation* messages are reused.

Proposal 8 In NCR-MT capability discussion, to focus on mandatory features that are required for NCR-MT.

Proposal 10 (Same as IAB-MT) All existing optional features are considered as applicable to NCR-MT unless explicitly excluded.

FFS on taking IAB specified features as a baseline for future discussion.

ZTE: companies are encoloured to provide contributions on mandatory features for the next meeting.

|  |
| --- |
| Agreements  gNB cell that NCR-Fwd is forwarding is the same cell the NCT-MT is connected to. Whether the NCR-Fwd can forward other cells is up to implementation  NCR-MT indicates the maximum number of supported DRB in UE capability, values {1, 16}. If absent, the NCR-MT does not support DRB.  SRB2 is mandatory feature for NCR-MT.  On NCR-Fwd ON/OFF:   * When NCR-MT is in RRC\_CONNECTED mode, the NCR-Fwd can be ON or OFF following the side control information received from the gNB. * After NCR-MT enters RRC\_INACTIVE mode, the NCR-Fwd can be ON or OFF following the last configuration received from the gNB. * Release to RRC-IDLE is FFS.   On NCR-MT RLF:   * After RLF is declared by NCR-MT, NCR-MT performs cell selection and trigger RRC re-establishment; * If NCR-MT enters RRC\_IDLE due to no suitable cell is find, NCR-Fwd is OFF; * During RRC re-establishment procedure, NCR-Fwd is OFF.   NCR-MT mandatorily support cell reselection and RRM measurements in RRC\_IDLE and RRC\_INACTIVE.  In Rel-18, NCR-MT does not support handover and RRM measurements in RRC\_CONNECTED.  For reporting the capabilities of NCR-MT, the existing *UECapabilityEnquiry* and *UECapabilityInformation* messages are reused.  In NCR-MT capability discussion, to focus on mandatory features that are required for NCR-MT.  All existing optional features are considered as applicable to NCR-MT unless explicitly excluded (Same as IAB-MT). FFS on taking IAB specified features as a baseline for future discussion.  NPN capable NCR-MT should consider *cellReservedForOtherUse* for determination of an NPN-only cell. |

Proposal xx: NCR-MT ignores *cellReservedForOtherUse* for cell barring determination, but the NPN capable NCR-MT should consider *cellReservedForOtherUse* for determination of an NPN-only cell.

HW: NCR-MT can be in NPN cell

AT&T: what “consider” means in this context?

HW: the wording is from the existing spec for IAB-MT, it means that NCR-MT should read this parameter to understand the cell ins NPN

Intel: this implies NCR-MT can connect even if it is barred?

Note: the following documents are not expected to be discussed online due to lack of time.

[R2-2211376](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211376.zip) Discussion on NCR Functionality and UE Capability Intel Corporation discussion Rel-18 NR\_netcon\_repeater

[R2-2211474](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211474.zip) Configuration of Network-controlled Repeater Qualcomm Inc. discussion Rel-18 NR\_netcon\_repeater

[R2-2211521](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211521.zip) NCR-MT RRM functions Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_netcon\_repeater

[R2-2211695](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211695.zip) Discussion on Signaling for side control information Apple discussion DUMMY

[R2-2211802](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211802.zip) Discussion on Signaling for Side Control Information vivo discussion Rel-18

[R2-2211857](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211857.zip) Discussion on state transition for NCR-MT Fujitsu discussion Rel-18 NR\_netcon\_repeater

[R2-2211915](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211915.zip) Considerations on side control information Sony discussion Rel-18 NR\_netcon\_repeater

[R2-2211976](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211976.zip) On NCR Features supported Samsung R&D Institute UK discussion Rel-18 NR\_netcon\_repeater

[R2-2212017](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212017.zip) Discussion on open issues for NCR-MT Lenovo discussion Rel-18

[R2-2212143](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212143.zip) Signaling for side control information and RRM functions CATT discussion Rel-18 FS\_NR\_netcon\_repeater

[R2-2212498](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212498.zip) Considerations on NCR remaining issues NEC Corporation discussion

[R2-2212525](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212525.zip) Further consideration of network-controlled repeaters Kyocera discussion Rel-18

[R2-2212621](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212621.zip) Discussion on signaling for side control information CMCC discussion Rel-18 FS\_NR\_netcon\_repeater

[R2-2212731](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212731.zip) RLM/RRM support for NR network-controlled repeaters AT&T discussion

[R2-2212791](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212791.zip) Discussion on signalling for side control information China Telecom discussion

[R2-2212920](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212920.zip) Resolving open issues for NCR. LG Electronics discussion Rel-18

### 8.1.3 Repeater management

Including Identification and authorization of network-controlled repeaters, taking into accout feedback from SA3 (S3-223080).

Note: the following documents will be discussed online.

[R2-2211173](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211173.zip) Reply LS on NCR Solutions (S3-223080; contact: ZTE) SA3 LS in Rel-18 FS\_NR\_netcon\_repeater To:RAN3 Cc:RAN2, SA2, SA5

*Moved from 8.1.1*

Chair: can we leave this topic to RAN3?

QCOM: agree, RAN3 are handling this issue

Huawei: agree it can be left to RAN3

* RAN2 will not treat this topic under the assumption it will be handled by RAN3

[R2-2211475](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211475.zip) Management of Network-controlled Repeater Qualcomm Inc. discussion Rel-18 NR\_netcon\_repeater

Proposal 1: Solution 2 is deprioritized since it does not provide inter-vendor inter-operability and it does not meet SA3’s security requirements.

Proposal 2: Solutions 1, 3 and 4 rely on CN-based authorization, which is in RAN3 scope.

Proposal 3: Discussions on the RAN validation function are pending the selection of Solution 1 by RAN3.

Note: the following documents are not expected to be discussed online due to lack of time.

[R2-2211199](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211199.zip) Way forwad for NCR management Huawei, HiSilicon discussion Rel-18 NR\_netcon\_repeater

[R2-2211377](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211377.zip) Authorization and verification of NCR: RAN2 impact Intel Corporation discussion Rel-18 NR\_netcon\_repeater

[R2-2211522](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211522.zip) Down-selection of NCR management solutions Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_netcon\_repeater

[R2-2211696](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211696.zip) Discussion on NCR repeater management Apple discussion DUMMY

[R2-2211803](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211803.zip) Discussion on NCR Management vivo discussion Rel-18

[R2-2211858](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211858.zip) Discussion on NCR management Fujitsu discussion Rel-18 NR\_netcon\_repeater

[R2-2211881](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211881.zip) Repeater management Samsung R&D Institute UK discussion

[R2-2211909](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211909.zip) Consideration on NCR management ZTE Corporation, Sanechips discussion Rel-18 NR\_netcon\_repeater

[R2-2211916](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2211916.zip) Clarifications about NCR management solutions based on SA3 reply Sony discussion Rel-18 NR\_netcon\_repeater

[R2-2212018](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212018.zip) Discussion on repeater management for NCR-MT Lenovo discussion Rel-18

[R2-2212144](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212144.zip) Management of Network-Controlled Repeater CATT discussion Rel-18 FS\_NR\_netcon\_repeater

[R2-2212493](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212493.zip) Discussion on capabilities and remaining issues for NCR Ericsson discussion Rel-18 NR\_netcon\_repeater

[R2-2212497](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212497.zip) Down-selection of NCR management solutions NEC Corporation discussion

[R2-2212499](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212499.zip) Management of Network-controlled repeater Philips International B.V. discussion Rel-18

[R2-2212609](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212609.zip) Discussion on NCR management Rakuten Mobile, Inc discussion Rel-18

[R2-2212622](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212622.zip) Discussion on the network-controlled repeater management CMCC discussion Rel-18 FS\_NR\_netcon\_repeater

[R2-2212793](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212793.zip) Discussion on identification and authorization of Network-Controlled Repeaters China Telecom discussion

[R2-2212853](file:///Users/sasha.sirotkin/meetings/TSGR2_120/Docs/R2-2212853.zip) NCR management MediaTek Inc. discussion Rel-18