**3GPP TSG RAN WG2 Meeting #121-bis-e**    **R2-230xxxx**

Electronic meeting, 17th– 26th Apr, 2023

Agenda Item: 7.1.2

Source: ZTE Corporation (Rapporteur)

Title: Summary of [AT121bis-e][704][NCR] NCR RRC running CR (ZTE)

Document for: Discussion and Decision

# Introduction

This document is the summary of below offline discussion:

|  |
| --- |
| **[AT121bis-e][704][NCR] NCR RRC running CR (ZTE)** Scope: Implement agreements from the meeting Intended outcome: draft CR in R2-2304414 Deadline: NCR CB session |

In this document, we focus on the remaining RRC related proposals from the following summaries.

R2-2303288 Report of [Post121][703][NCR] Open issues on NCR RRC ZTE Corporation report Rel-18 NR\_netcon\_repeater

R2-2304411 Summary of agenda item 7.1.2 on signalling for SCI (ZTE)

R2-2304412 Summary of agenda item 7.1.3 on other RAN2 aspects for NCR (Nokia)

The RRC running CR will be updated based on the outcome of this discussion.

# Contact information

Companies providing input to this email discussion are invited to leave contact information below.

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email Address** |
| Samsung | Jonas Sedin | j.sedin@samsung.com |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# Discussion

## Wake-up timer

The following proposals are related to wake-up timer:

|  |
| --- |
| #from R2-2303288**Proposal 3**  To further discuss the following 2 options.* (6/12)Option 1: To define “wake-up timer” IE in RRCRelease message;
* (6/12)Option 2: Do not define “wake-up timer” IE in RRCRelease message, if needed, it can be done via OAM (no specification impact).

#from R2-2304412**Proposal 1:** If “wake-up timer” IE is agreed: The NCR-MT shall stop the wake-up timer when it performs cell reselection in RRC\_IDLE state.**Proposal 2:** If “wake-up timer” IE is agreed: RAN2 should discuss how an NCR-MT not supporting DRB shall initiate connection setup:* Option 1: RRC of NCR-MT sends a notification to NAS of NCR-MT, and NAS of the NCR-MT transmits a NAS message. RAN2 sends LS to CT1 to inform the decision.
* Option 2: Leave it to implementation within “upper layers”.
* FFS if establishmentCause impacts within RRCSetupRequest.

**Proposal 3:** If “wake-up timer” IE is agreed: RAN2 should discuss whether prohibit timer should be introduced in RRCRelease message to prevent NCR-MT from initiating new connections prematurely. |

Regarding whether to introduce wake-up timer in RRCRelease message, based on online discussion on Monday, slightly majority companies prefer Option 2, but some companies have strong concern on the OAM-based solution (Option 2). During online discussion, there was also comment on whether NCR-MT’s AS layer or NAS layer should initiate the RRC connection setup procedure upon timer expires.

**Q1. When releasing NCR-MT to RRC\_IDLE state, which option (1 or 2) do you prefer regarding the wake-up timer? Please elaborate your views on the following aspects:**

* For Option 1, whether NCR-MT’s AS layer or NAS layer will initiate RRC connection setup procedure upon timer expires, any impacts in RAN2 or CT1?
* For Option 1, do you think the NCR-MT shall stop the timer when it reselects a different cell?
* Is there a case that Option 2 (OAM) doesn’t work, e.g. DRB is not supported?
* For Option 2, do you agree there is no spec impact in RAN2?

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Preferred Option** | **Unacceptable option (if you have)** | **Comments** |
| Samsung | Option 1 | Option 2 | To summarize our points on why we do not agree to Option 2: * gNB does not know when it can reliably release an NCR as it does not know when OAM has configured NCR correctly.
* We are solving a problem that we can solve with RRC. If companies think that they have a magic OAM solution, then they can decide to not configure the wakeup timer in RRC release
* Releasing an NCR would likely be similar to releasing a UE as OAM does not trigger gNB to release specific UEs. When would a gNB release an NCR. In many cases, but one of these is done when maintenance/update of a gNB is being performed.

For the timer, we think that it can be entirely within the AS layer, but we are open to input on this. We think it can be designed in the following manner:* The timer can trigger the RRC establishment procedures of 38.331 5.3.3.2 under the conditions T300 is not running and NCR-MT is camping on a suitable cell and is stopped on reception of RRCSetup.
* The NAS message in *dedicatedNAS-Message* in *RRCSetupComplete* does not need to be present in order for the ASN1 decoder to function as OCTET STRING can be of zero length. Thus when the timer is triggered, the field is encoded with zero-length. The gNB does not see this as an error because gNB does not parse the NAS message.
* Value range suggested in our contribution: 5, 10, 20, 30, 60, 120, 240, 480 min.
 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## NCR-MT in RRC\_INACTIVE

### NCR-Fwd ON/OFF

The following proposals are related to NCR-Fwd ON/OFF when NCR-MT is in RRC-INACTIVE state:

|  |
| --- |
| #from R2-2303288Proposal 2: The NCR-Fwd is switched OFF if the NCR-MT in RRC\_INACTIVE detects no suitable cell.Proposal 7 To discuss whether the NCR-MT indicates the NCR-Fwd to resume forwarding when the NCR-MT reselects back to the serving cell on which side control configuration was received.  |

For Proposal 2, most companies share the same understanding during Post email discussion, so rapporteur suggests to confirm the understanding, currently, TS 38.304 only captures the NCR-Fwd is OFF when NCR-MT reselects to a different cell, it does not capture the case when no suitable cell is found.

**Q2. Do you agree with Proposal 2 in R2-2303288?**

* Proposal 2 The NCR-Fwd is switched OFF if the NCR-MT in RRC\_INACTIVE detects no suitable cell.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No?** | **Comments** |
| Samsung | Yes | This is needed as the current procedures does not explain what happens if no cell is found. If we use the current text, the NCR-Fwd would remain ON if no cell is found. We see some companies arguing that this agreement is not needed because we made an agreement on RLF that mentions NCR-Fwd is no suitable cell detected. But the problem is that what has been captured in spec text for this agreement is that NCR-Fwd is turned OFF after RRC re-establishment has been triggered. This does not cover the problem that this proposal is addressing.  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

For Proposal 7 in R2-2303288 and Proposal 6 in R2-2304412, they both talk about the NCR-Fwd behaviour when the NCR-MT detects the change of DL radio quality.

For Proposal 7, as agreed in RAN2, the NCR-MT will inform the NCR-Fwd to be OFF when the NCR-MT reselects a different cell. However, it is unclear whether the NCR-Fwd can be ON again when the NCR-MT reselects back to the cell on which side control information was received.

**Rapporteur comments:**

* When reselection happens, the side control information configured by source cell may not be applicable even if the NCR-MT reselects back to previous serving cell. e.g. the beam indicated for backhaul link and access link may be not applicable any more, so it is safer to keep the NCR-Fwd OFF. If the network wants the NCR to resume forwarding in such situation, it can configure NCR to initiate RRC resume procedure upon cell reselection (e.g. by configuring RNA = serving cell).

**Q3. After NCR-Fwd turns OFF upon cell reselection, do you agree that NCR-Fwd is still OFF when the NCR-MT reselects back to the serving cell on which side control configuration was received?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No?** | **Comments** |
| Samsung | Yes | Some companies are suggesting that the NCR-Fwd can be turned ON again after a ping-pong event, but the tricky part is to define what is considered a ping-pong event. If a long time passes in between reselecting to the old cell, then the NCR-Fwd configuration associated with the old cell may no longer be relevant to apply. In this release we think we can make it simple and have the NCR-Fwd be OFF when reselecting another cell. We think that this should probably also be reflected in 38.304, i.e the spec text should read that the *NCR-Fwd is turned OFF when re-selecting to a better cell*, which we originally proposed.  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

### Backhaul beam monitoring

The following proposal is related to backhaul beam monitoring when NCR-MT is in RRC\_INACTIVE.

|  |
| --- |
| #from R2-2304412**Proposal 6:** RAN2 should discuss backhaul beam monitoring by NCR-MT in RRC\_INACTIVE:* Option 1: NCR-MT in RRC\_INACTIVE state may perform backhaul beam monitoring. FFS if anything further to be specified or if left to implementation.
* Option 2: NCR-MT in RRC\_INACTIVE state may not perform backhaul beam monitoring. gNB may perform link monitoring for the backhaul link by implementation when NCR-MT is in RRC\_INACTIVE state.

NOTE: If Option 1 is agreed, the following proposals can also be considered:* **Proposal 6-1:** The NCR-FWD switches OFF if the NCR-MT in RRC\_INACTIVE mode detects beam failure.
* **Proposal 6-2:** The NCR-MT in RRC\_INACTIVE resumes connection to receive updated side control configuration if it reselects a new beam of the same camped cell.
 |

For Proposal 6 in R2-2304412, two options are provided on whether/how to monitor the backhaul link.

* Option 1: NCR-MT in RRC\_INACTIVE state may perform backhaul beam monitoring. FFS if anything further to be specified or if left to implementation.
* Option 2: NCR-MT in RRC\_INACTIVE state may not perform backhaul beam monitoring. gNB may perform link monitoring for the backhaul link by implementation when NCR-MT is in RRC\_INACTIVE state.

**Rapporteur comments:**

* We think it is worth to clarify first which beam the NCR-Fwd will use for DL/UL backhaul link when NCR-MT in RRC\_INACTIVE state. In our view, we need to keep the alignment between NCR-Fwd and gNB (the gNB should know which beams are used for backhaul link), therefore, the NCR-Fwd should keep using the beam for backhaul link according to the last configuration received from the gNB, this means the beams used for backhaul link should not change even if NCR-MT detects other best DL beams.
* However, we think there is no need to specify beam monitoring specifically for NCR-MT. In our view, the beam quality monitoring can be performed by the gNB according to the reciprocity of downlink and uplink beam. For example, the gNB knows the uplink beam of the backhaul link, and the time resources configured for forwarding (i.e. the side control information that is applied in RRC\_INACTIVE state), it can keep monitoring the uplink signalling that is forwarded by the NCR-Fwd on the time resource associated with the backhaul uplink beam. Then gNB can deduce the downlink quality according to the uplink beam quality. Thus Option 2 is preferred and no specification impact is foreseen.
* For option 1, we think NCR-Fwd is unable to perform beam monitoring (only NCR-MT can do), but the beam used for backhaul link can be different from the beams used for C-link, so it is problematic to ask NCR-MT to do beam monitoring on behalf of NCR-Fwd.

Companies are invited to show your views.

**Q4. Do you think the issue is valid? And which option do you prefer regarding the backhaul beam monitoring?**

(If answers Option 1, please elaborate the expected NCR-MT’s behaviour on how backhaul beam monitoring is performed)

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred Option** | **Comments** |
| Samsung | Option 2 | We can partly see the problem as proposed originally by Qualcomm, but we think introducing BFR in RRC inactive will be too much of a challenging task for now in this release. We agree with the rapporteur that it should be clarified that the NCR-Fwd keeps using the beam for backhaul link according to the last configuration received from the gNB.  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

### Last configuration

For the clarification of last configuration, we have below proposal:

|  |
| --- |
| #from R2-2303288Proposal 5 For NCR-MT in RRC\_INACTIVE state, the periodic beam indication configuration (if configured and not removed) is applied for NCR-Fwd ON/OFF.* (2/12)FFS whether aperiodic beam indication configuration (if activated by DCI before RRCRelease) can be applied;
* (3/12)FFS whether semi-persistent indication configuration (if activated by MAC CE before RRCRelease) can be applied;
 |

Based on the Post email discussion, majority companies agree that periodic beam indication configuration can be applied when NCR-MT is in RRC\_INACTIVE, but companies are encouraged to show your views to aperiodic and semi-persistent beam indication configuration.

**Q5. When NCR-MT is in RRC\_INACTIVE state, do you think the periodic beam indication configuration (if configured and not removed) can be applied for NCR-Fwd ON/OFF?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Samsung | Yes | Confusing proposal. Based on the text and the discussions we interpret the question as: **Q5bis. When NCR-MT is released to RRC\_INACTIVE state (NCR-Fwd is forwarding), do you think the periodic beam indication configuration (if configured and not removed) shall be still be applied?**We think this is obviously needed, otherwise NCR-Fwd would clearly be OFF.  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Q6. When NCR-MT is in RRC\_INACTIVE state, do you think the aperiodic beam indication configuration (if activated by DCI before RRCRelease) can be applied for NCR-Fwd ON/OFF?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Samsung | No, but no strong view | Assuming the question is: **Q6bis. When NCR-MT is released to RRC\_INACTIVE state (NCR-Fwd is forwarding), do you think the aperiodic beam indication configuration (if configured and not de-activated by DCI before RRCRelease) shall still be applied?**We have sympathy for the companies that want to allow for this, but we think we can keep the procedures simple and not allow for this in this release.  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Q7. When NCR-MT is in RRC\_INACTIVE state, do you think the semi-persistent beam indication configuration (if activated by MAC CE before RRCRelease) can be applied for NCR-Fwd ON/OFF?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Samsung | No, but no strong view | Assuming the clarifications above, we have sympathy for the companies that want to allow this, but we think that we can keep the procedures simple and not allow for this in this release.  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

### Discard of last configuration

Regarding whether to discard the received side control information, we have below proposal:

|  |
| --- |
| #from R2-2303288Proposal 6 Regarding whether/when to discard the received beam indication configuration (i.e. NCR-FwdConfig-r18), to discuss the following options:* (8/12)Option 1: The NCR-MT in RRC\_INACTIVE discards the configuration when it initiates RRC resume procedure in a cell different from the released cell (this implies delta configuration is supported only in the released cell).
* Option 2: The NCR-MT in RRC\_INACTIVE does not discard the configuration autonomously (this implies delta configuration is supported in any cell).
 |

**Rapporteur comments:**

* We think Option 1 makes more sense because when the NCR-MT resumes in a different cell, most likely the previous received side control configuration is not applicable any more (e.g. beams are changed), so it is unable for the network to do delta configuration. However, from signalling point of view, there is no big issue to keep the configuration and wait for the new configuration from target cell. E.g. the target cell can release the configuration if not applicable, so both options work and better to choose the one that most people like.

**Q8. Which option (1 or 2) do you prefer?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred Option** | **Comments** |
| Samsung | Option 2 | We argued for Option 1 before, but we think that Option 2 is actually more in-line with how a UE operates in RRC inactive where a new gNB can acquire the UE configuration from old gNB and resume the connection. Option 1 would require explicitly to state that the configuration is discarded.  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## RRC re-establishment

RAN2 has agreed that NCR-Fwd is OFF when RLF is detected, regarding when to resume forwarding, we have below proposal:

|  |
| --- |
| #from R2-2303288Proposal 8 To discuss how to resume NCR-Fwd when RRC re-establishment is succeed:* Option 1: Wait for the new configuration/indication (RRC/MAC CE/DCI) from the network.
* Option 2: When RRC re-establishment is succeed, the NCR-MT indicates to NCR-Fwd to resume forwarding following the last configuration received before RLF.
 |

**Rapporteur comments:**

* Different from beam failure recovery, the network always sends RRCReconfiguration during RRC re-establishment procedure, so it is easy for the network to provide new side control information to the NCR-MT;
* Similar to the issue discussed in Q3 and Q4, when RRC re-establishment happens, it is possible the previous received side control information is not applicable, so it is safer to wait for the new configuration.

**Q9. Which option (1 or 2) do you prefer?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred Option** | **Comments** |
| Samsung | Option 2 | We think that the Option 2 has merits because it allows for faster resumption of the NCR forwarding and is in line with how beam failure recovery functions.  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## RRC release with redirection for NCR-MT

The following proposal is related to RRC release with redirection for NCR-MT:

|  |
| --- |
| #from R2-2304412**Proposal 7:** NCR-MT supports RRC release with redirection. If NCR-MT reselects a new cell due to redirection, NCR-Fwd is OFF. |

The issue is that whether NCR-MT supports RRC release with redirection? if supported, what’s the expected behaviour when redirection is triggered?

**Rapporteur comments:**

* Considering the handover is not supported by NCR-MT, it is beneficial to allow the network to use RRC release with redirection to move the NCR-MT from serving frequency to another frequency, otherwise, if multiple NCR-MT are deployed in the same area, based on current cell reselection mechanism, they may camp on the same carrier (e.g. lower spectrum) at the same time.
* If companies have concern on how to initiate RRC connection setup after cell selection, in case suspendConfig is not included, the NCR-MT enters RRC\_IDLE state and wake-up timer (via OAM or RRC) can be applied. If suspendConfig is included, the NCR-MT enters RRC-INACTIVE state and the network can use RAN paging to wake the NCR-MT up.

**Q9. Do you agree that RRC release with redirection is applicable to NCR-MT, no further enhancement is needed and NCR-Fwd is OFF when NCR-MT selects a new cell due to redirection?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred Option** | **Comments** |
| Samsung | Agreed | Do not see why it should not be supported. If not supported, then we will likely limit some network-implementations as handovers are not supported.  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## Other proposals

The following proposals are considered as low-priority in R2-2304412.

|  |
| --- |
| **Proposal 8:** Cells in forbidden cell list (if configured) are considered as barred for NCR-MT. Cells not in allowed cell list (if configured) are considered as barred for NCR-MT.**Proposal 9:** NCR-MT prioritization of cells for reselection is based on configured allowed and/or forbidden cell lists.[Rapp-ZTE]: P8 and P9 are both related to the “allowed/forbidden cell list” agreed in RAN3. Based on RAN3’s conclusion, the cell list may be configured via OAM.We understand technically, P8/P9 are aligned with RAN3’s intention when introducing the “allowed/forbidden cell list”, however, we think there is no need capture it explicitly in stage 3 as they are all OAM initiated and controlled behaviours. **Proposal 10:** RAN2 should discuss if NCR-Fwd is turned OFF when the “NCR-support” in SIB1 of the last serving cell on which side control configuration was received has been toggled OFF.[Rapp-ZTE]: As long as the NCR-MT is camping on a cell, the NCR-MT needs to check the NCR-support indicator in SIB1, for cell that does not broadcast “NCR-support”, it will be considered as barred for NCR-MT, in this case, the NCR-MT needs to reselect another cell and NCR-Fwd will turn OFF once reselection happens, so this is already covered based on current spec.On the other hand, we think a smart network will not update the “NCR-support” indicator when it already knows there is NCR working(ON) in the cell. **Proposal 11:** RAN2 should discuss and agree on the separation of compliance check for NCR-MT and NCR-Fwd configuration, and that NCR-MT indicates NCR-FWD’s configuration failure to the network via at least OAM.[Rapp-ZTE]: In our understanding, although NCR-MT and NCR-Fwd are defined as two separate logic entities, only the NCR-MT will do compliance check of the RRC reconfiguration message, so there is no need to introduce separate compliance check for NCR-MT and NCR-Fwd. **Proposal 12:** RAN2 should discuss whether NCR-MT shall support configuration of the same SMTC periodicities as IAB-MTs (i.e. periodicityAndOffset-r16 within SSB-MTC3-r16).[Rapp-ZTE]: In our understanding, the SMTC3 was introduced for IAB node to discover and measure other IAB nodes. For NCR-MT, the NCR-MT will only measure the SSB sent by the network, considering usually the NCR-MT is operating in RRC\_CONNECTED mode and RRM measurement is not supported in RRC\_CONNECTED mode, the benefit of configuring large SMTC periodicity for NCR-MT is not clear. On the other hand, this is kind of optimization and not so critical at this stage.**Proposal 13:** RAN2 should discuss if LS should be sent to RAN1 to enquire whether separate PRACH resources specific to NCR-MT should be defined, either based on separate PRACH occasions (like Rel-16 IAB) or based on PRACH partitioning (like Rel-17 RedCap, SDT, Slicing and Coverage Enhancement).[Rapp-ZTE]: Firstly, the NCR-MT will not trigger RACH procedure frequently, so there is no need to worry about the RACH collision between NCR-MT and NCR. Secondly, PRACH partitioning was defined to address specific use cases, for example, 1) to identify UE’s type (RedCap), so the network can take proper action earlier; 2) to identify whether the UE triggers/requests specific actions (e.g. SDT, Msg3 repetition).For NCR-MT, it is sufficient to identify the device type based on the indication in Msg5. it is not necessary to allocate specific RACH resource for NCR-MT.**Proposal 14:** Define an NCR-specific q-RxLevMinNCR and specify that Qrxlevmin applied in NCR-MT cell selection criterion S is obtained from q-RxLevMinNCR.[Rapp-ZTE]: Regarding whether to introduce a NCR-specific cell selection threshold, we share the views from Nokia in R2-2304412 that NCR is a network device and the RF characteristics of the device would already be quite different from other UEs. And this is also kind of optimization and not critical at this stage.  |

Due to limited time, rapporteur has provided some comments to each proposal, rapporteur would suggest to focus on essential issues. So please companies check the proposals, and if you found anything that needs to be discussed or supported in RAN2, please indicate in below table:

**Q9. Which of above proposals do you think needs to be discussed (or supported) in RAN2 ?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Which proposal(s)** | **Comments** |
| Samsung | Proposal 11 | **We think it should at least be clarified that the compliance check is done only on the NCR-MT configuration.** Regarding the Rapporteur’s comment (only MT is doing compliance check, so there is no need of separation of compliance check.) it seems like there has been a misunderstanding with this proposal. Our proposal is to let MT check only its own configuration, not for FWD configuration. Checking FWD config can be up to the implementation, and no need to be captured in the SPEC. If not doing this, MT always has to check both MT and FWD configuration, which means implementation restriction where Fwd should always report to the MT whether it can comply with the received FWD configuration in RRCReconfiguration. Moreover, MT will do the Reestablishment procedure even if Uu interface has no problem (i.e., MT configuration is compliant) due to only FWD configuration not being compliant. Why do we want this operation? |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# Conclusion

Based company inputs, the proposals are:

TBD

# References

[1] RAN2#120 Chairman notes