**3GPP TSG-RAN3 #107bis-e R3-202608**

20th April – 30th April 2020

Online

Agenda Item: 09.3.8.1

Source: Ericsson

Title: Summary of Discussions on RRC Reconfiguration in DU initiated UE Context Modification Required

Document for: Discussion, Decision

# Introduction

During RAN3-107bis-e the proposals in R3-202116 were discussed.

R3-202116 proposes that

**Proposal 1: the *RRC Connection Reconfiguration Complete Indicator* IE should be used also to indicate the result of RRC Reconfigurations triggered by a gNB-DU initiated UE Context Modification procedure.**

And it proposed to agree to CRs in R3-202031 and in R3-202115, which add to the dNB-DU initiated UE context Modification procedure the following paragraph already present in the gNB-CU initiated UE Context Modification procedure.

**Interaction with other procedures:**

If the ongoing reconfiguration procedure involves changes of the L1/L2 configuration at the gNB-DU signalled to the gNB-CU via the *CellGroupConfig* IE included in the UE CONTEXT MODIFICATION REQUIRED message and if the reconfigurations is completed, the gNB-CU shall trigger a UE CONTEXT MODIFICATION REQUEST including the *RRC Reconfiguration Complete Indicator* IE to inform the gNB-DU that the ongoing reconfiguration procedure, including *CellGroupConfig* IE, has been successfully or unsuccesfully performed. In the case that the ongoing reconfiguration procedure has failed, the gNB-DU shall continue to use the old UE configuration.

Namely, the proposals above do not impact the ASN.1.

# Discussion

During online discussions the main issue raised is that there is in current specifications ambiguity about how the gNB-DU learns of completion of an RRC reconfiguration triggered by the gNB-DU via signaling of the gNB-DU initiated UE Context Modification.

On one side, the standard has specified an IE named *RRC Reconfiguration Complete Indicator* IE, which is defined as follows:

#### *9.3.1.30 RRC Reconfiguration Complete Indicator*

*This IE indicates the result of the reconfiguration performed towards the UE.*

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| --- | --- | --- | --- | --- |
| *IE/Group Name* | *Presence* | *Range* | *IE type and reference* | *Semantics description* |
| *RRC Reconfiguration Complete Indicator* | *M* |  | *ENUMERATED (true, ... , failure)* |  |

From the above one could interpret that completion of an RRC reconfiguration is always flagged via this purpose defined IE and in fact, nothing prevent an implementation today to aleays signal RRC Reconfiguration completion to the gNB-DU by means of the *RRC Reconfiguration Complete Indicator* IE in F1: UE Context Modification Request.

On the other side, the specifications do not explicitly describe the use of this IE for RRC reconfigurations triggered by the gNB-DU (via gNB-DU initiated UE CONTEXT MODIFICATION REQUIRED e.g. including a new *CellGroupConfig* IE).

In such cases of gNB-DU triggered RRC Reconfigurations, some companies believe that the UE CONTEXT MODIFICATION CONFIRM can serve as a confirmation of completion of the RRC Reconfiguration.

Therefore, the following problem exists and companies are invited to provide their input on it:

Problem statement: The standard needs to be enhanced to describe how successful/unsuccessful completion of an RRC Reconfiguration triggered by the gNB-DU via signalling of a UE CONTEXT MODIFICATION REQUIRED can be signalled to the gNB-DU.

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| --- | --- |
| Company | Comments |
| Ericsson | Yes, the problem statement is correct and a solution to resolve it is needed |
| HW | We are still not sure about the problem, for gNB-DU initiated UE CONTEXT MODIFICATION REQUIRED, there is UE CONTEXT MODIFICATION CONFIRM for success case and UE CONTEXT MODIFICATION REFUSE for failure case. |
| Nokia | No, and no change is needed in our view.  However, Solution 3 could be considered as a compromise to address the concern in R3-202116, via introduction of RRC Reconfiguration Complete Indicator to UE CONTEXT MODIFICATION CONFIRM message. |
| CATT | Yes |
| ZTE | Same view as HW, try to understand why the UE CONTEXT MODIFICATION CONFIRM/FAILURE can not give clear result towards the DU. |
| Samsung | We think it is benefit to have such clarification |

Assuming it is acknowledged that the Problem Statement above is valid, a number of approaches were made available during online discussions

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| --- | --- |
| Solution 1 | Described in R3-202031 and in R3-202115. Add the following text, already present in the UE Context Modification (gNB-CU Initiated) procedure, to the description of the UE Context Modification (gNB-DU Initiated) procedure:  **Interaction with other procedures:**  If the ongoing reconfiguration procedure involves changes of the L1/L2 configuration at the gNB-DU signalled to the gNB-CU via the *CellGroupConfig* IE included in the UE CONTEXT MODIFICATION REQUIRED message and if the reconfigurations is completed, the gNB-CU shall trigger a UE CONTEXT MODIFICATION REQUEST including the *RRC Reconfiguration Complete Indicator* IE to inform the gNB-DU that the ongoing reconfiguration procedure, including *CellGroupConfig* IE, has been successfully or unsuccesfully performed. In the case that the ongoing reconfiguration procedure has failed, the gNB-DU shall continue to use the old UE configuration.  This implies that, in order to confirm the successful/unsuccessful outcome of the RRC reconfiguration to the gNB-DU, a new gNB-CU initiated UE context Modification Procedure needs to be triggered. |
| Solution 2 | Take the assumption that the UE Context Modification Confirm message also confirms successful completion of the RRC Reconfiguration.  This implies that UE Context Modification Confirm cannot be signaled until the RRC Reconfiguration is terminated (nested procedures).  It also implies a change in the UE Context Modification (gNB-DU initiated) procedure. Currently a failure in this procedure can be signalled only as quoted from TS38.473:  **“**In case none of the requested modifications of the UE context can be successfully performed, the gNB-CU shall respond with the UE CONTEXT MODIFICATION REFUSE message with an appropriate cause value.**”**  Hence, the sole failure of the RRC Reconfiguration would not trigger a UE CONTEXT MODIFICATION REFUSE. It is therefore not possible to signal to the gNB-DU that the RRC Reconfiguration failed, while other changes in the UE context succeeded. |
| Solution 3 | Introduce the RRC Reconfiguration Complete Indicator IE in the UE Context Modification Confirm.  This implies that UE Context Modification Confirm cannot be signaled until the RRC Reconfiguration over RRC is terminated (nested procedures). It also implies a change in the ASN.1. |

In light of the above, companies are invited to provide their view on the different solutions available:

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| Company | Solution | Comments |
| Ericsson | Solution 1 | Solution 1 is the one with the least impact because it re-uses the purpose-designed *RRC Reconfiguration Complete Indicator* IE in the F1: UE Context Modification Request, hence with no ASN.1 impact and with no functional impact (the F1: UE Context Modification Request can be used already today to confirm successful/unsuccessful reconfigurations). |
| Huawei |  | Since we are still not sure if there are any issues here, we don’t see any solution needed for the moment, for solution 1, the interaction procedure actually is clear, either confirm message or refuse message; for solution 2, since if DU requires L1/L2 change which will lead to RRC reconfiguration, anyway confirm or refuse message should wait for the confirmation of a successful reconfiguration; for solution3, it complicates the situation, since DU is expecting a confirm/refuse message, while CU sends an modification request message instead, in addition, CU may still have to send a confirm message, which indeed makes things more confused. |
| Nokia | None needed. But Solution 3 could be considered. | Overall, in our view the existing specification does not require change in this regard. Likewise, Solution 1 is not acceptable as it incurs non-backwards compatible changes from a functional perspective given it introduces mandating and additional procedure, and which is not necessary in our view. Likewise, it would neglect scenarios which are valid with the existing specification.    However, to address the concern of proponents of Solution 1 in regard to having an explicit indication to the DU via RRC Reconfiguration Complete Indicator IE, Solution 3 was suggested as a possible compromise to consider that would allow both signaling options.  Solution 3, would introduce the RRC Reconfiguration Complete Indicator to UE CONTEXT MODIFICATION CONFIRM, and could be introduced in a way to allow flexibility to accommodate both signaling approaches. The idea would be that L1/L2 changes signaled via CellGroupConfig from DU, would have the success/failure acknowledged back from CU either by a UE CONTEXT MODIFICATION CONFIRM (including the RRC Reconfiguration Complete Indicator) or via an additional UE CONTEXT MODIFICATION REQUEST (including the RRC Reconfiguration Complete Indicator). Nevertheless, both approaches would remain valid. |
| CATT | Solution 1 | The intention to introduce RRC Reconfiguration Complete Indicator IE is to let DU be aware of the completion of RRC Reconfiguration which applied for both CU initiate UE context modification procedure and DU initiated UE context modification procedure. So, it completely fulfill the requirement.  The previous assumption in RAN3 on UE CONTEXT CONFIRM message is to confirm that the requested update is accepted by CU. If we check the definition of UE CONTEXT CONFIRM message,*RRC container* IE which includes the PDCP PDU for *RRCConnectionReconfiguration* is included.This means when CU send the UE CONTEXT CONFIRM message to DU, the RRCConnectionReconfiguration message is still not deliverred to UE.How can CU inform DU whether reconfigruation is completed or not at time itme? Therefore, we think solution 1 is the simpe solution which does not impact our previous agreement. |
| ZTE | None needed. If we have to do something, the Solution 3 could be considered. | When the gNB-CU sends the UE CONTEXT CONFIRM /FAILURE message to the gNB-DU is under implementation, the gNB-CU can send the response message after the RRC reconfig has been completed over air interface. |
| Samsung | Solution 1 | As CATT mentioned, the RRCReconfiguration message is included in the UE CONTEXT CONFIRM message. The only way to confirm RRC reconfiguration procedure, it is to trigger another UE Context modification procedure. |

# Conclusion

During offline discussions the following was identified:

Problem statement: The standard needs to be enhanced to describe how successful/unsuccessful completion of an RRC Reconfiguration triggered by the gNB-DU via signalling of a UE CONTEXT MODIFICATION REQUIRED can be signalled to the gNB-DU.

* 3 companies acknowledge the problem statement
* 3 ompanies did not acknowledge the problem statement and believe that the UE Context Modification Confirm can be used to acknowledge an RRC Reconfiguration triggered by the gNB-DU
* Of these 3 companies 2 companies propose to enhance the UE Context Modification Complete by including the *RRC Reconfiguration Complete Indicator* IE in it

During offline it was explained that:

* On the UE Context Modification Required (DU initiated) TS 38.473 states:

*In case none of the requested modifications of the UE context can be successfully performed, the gNB-CU shall respond with the UE CONTEXT MODIFICATION REFUSE message with an appropriate cause value.*

This means that if the RRC reconfiguration fails but some other parameter is successfully modified with the DU initiated UE context modification procedure, gNB-CU shall generate a UE Context Modification Confirm and NOT a UE context Modification Refuse.

IT is therefore not possible to convey to the gNB-DU that the RRC Reconfiguration is not successful via the UE context Modification Confirm.

* The previous assumption in RAN3 on UE CONTEXT MODIFICATION CONFIRM message is to confirm that the requested update is accepted by CU. If we check the definition of UE CONTEXT CONFIRM message, the RRC container IE which includes the PDCP PDU for RRCConnectionReconfiguration is included. This means that when CU sends the UE CONTEXT MODIFICAITON CONFIRM message to DU, the RRCConnectionReconfiguration message is still not delivered to the UE.   
  This helps understanding that CU cannot inform DU of whether an RRC re-configuration is completed at the time of sending the UE Context Modification Confirm .

Proposal1: it is proposed to remove Solution 3 from the list of possible solutions due to lowest support.

Proposal 2: It is proposed to acknowledge the following Problem Statement on the basis of the technical inputs received:

Problem statement: The standard needs to be enhanced to describe how successful/unsuccessful completion of an RRC Reconfiguration triggered by the gNB-DU via signalling of a UE CONTEXT MODIFICATION REQUIRED can be signalled to the gNB-DU.

Proposal 3: It is proposed to base the discussion on Solution 1 and Solution 2 and taking the inputs from the offline discussion into account.