3GPP TSG-RAN WG3 Meeting #110-e R3-206988

E-meeting, 2 – 12 November, 2020

**Agenda item: 9.3.7.1**

**Source: Ericsson (moderator)**

**Title: CB: # 98\_MeasGapConfig - Summary of email discussion**

**Document for: Approval**

# 1 Introduction

This paper provides summary of discussions at RAN#110-e on:

**CB: # 98\_MeasGapConfig**

**- need to clarify behavior on reception of MeasGapConfig IE? Same mechanism as Cell Group Config?**

**- maintain backwards compatibility!**

**- merge disc from 6773**

**- any delta w.r.t. previous discussions?**

(E/// - moderator)

# 2 For the Chairman’s Notes

Regarding the transparent signalling of MeasGapConfig it is proposed to agree to the following:

* **A new MeasGapConfig IE signalled from a gNB-DU to a gNB-CU should trigger a UE RRC reconfiguration aimed at configuring the measurement gaps**
* **A new MeasGapConfig IE signalled from a gNB-DU to a gNB-CU should be signalled to the UE transparently**

**It is FFS whether the principles above need to be captured in RAN3 specifications.**

Regarding the proposals on the *GNB-DU Configuration Query* IE, the following is proposed:

**It is proposed to continue discussions and to clarify why the gNB-CU should be able to query the latest version of the MeasGapConfiguration IE from the gNB-DU**

# 3 Discussion

## 3.1 Analysis of transparent Delivery of MeasGapConfig

In R3-206809 it is proposed to add the following sentence to the F1: UE Context Setup, UE Context Modification (gNB-CU initiated) and UE Context Modification (gNB-DU initiated):

If the *MeasGapConfig* IE is included in the *DU to CU RRC Information* IE contained in the UE CONTEXT MODIFICATION RESPONSE message, the gNB-CU shall perform RRC Reconfiguration as described in TS 38.331 [8]. The *MeasGapConfig* IE shall transparently be signaled to the UE as specified in TS 38.331 [8].

To understand the rationale behind this sentence let’s analyse what TS38.471 describes with regards to the use of the *MeasGapConfig* IE.

In TS38.473, section “8.3.1 UE Context Setup” it is mentioned that

If the gNB-CU includes the SMTC information of the measured frequency(ies) in the *MeasurementTimingConfiguration* IE of the *CU to DU RRC Information* IE that is included in the UE CONTEXT SETUP REQUEST message, the gNB-DU shall generate the measurement gaps based on the received SMTC information. Then the gNB-DU shall send the measurement gaps information to the gNB-CU in the *MeasGapConfig* IE of the *DU to CU RRC Information* IE that is included in the UE CONTEXT SETUP RESPONSE message.

If the *MeasConfig* IE is included in the *CU to DU RRC Information* IE in the UE CONTEXT SETUP REQUEST message, the gNB-DU shall deduce that changes to the measurements configuration need to be applied. If the *measObjectToAddModList* IE is included in the *MeasConfig* IE, then the frequencies added in such IE are to be activated. Then the gNB-DU shall decide if measurement gaps are needed or not and, if needed, the gNB-DU shall send the measurement gaps information to the gNB-CU in the *MeasGapConfig* IE of the *DU to CU RRC Information* IE that is included in the UE CONTEXT SETUP RESPONSE message. If the *measObjectToRemoveList* IE is included in the *MeasConfig* IE, the gNB-DU shall ignore it.

In TS38.473, section “8.3.4 UE Context Modification (gNB-CU initiated)” it is mentioned that

If the gNB-CU includes the SMTC information of the measured frequency(ies) in the *MeasurementTimingConfiguration* IE of the *CU to DU RRC Information* IE that is included in the UE CONTEXT MODIFICATION REQUEST message, the gNB-DU shall generate the measurement gaps based on the received SMTC information. Then the gNB-DU shall send the measurement gaps information to the gNB-CU in the *MeasGapConfig* IE of the *DU to CU RRC Information* IE that is included in the UE CONTEXT MODIFICATION RESPONSE message.

If the *MeasConfig* IE is included in the *CU to DU RRC Information* IE in the UE CONTEXT MODIFICATION REQUEST message, the gNB-DU shall deduce that changes to the measurements’ configuration need to be applied. The gNB-DU shall take the received info, e.g. the *measObjectToAddModList* IE, and/or the *measObjectToRemoveList* IE into account, when generating measurement gap and when deciding if a measurement gap is needed or not.

From the text mentioned above, it can be deduced the following:

* The gNB-DU is responsible to generate measurement gaps. Namely, the measurement gap configuration is decided by the gNB-DU and shall not be changed by the gNB-CU. This is confirmed by the text above stating that   
  Then the gNB-DU shall send the measurement gaps information to the gNB-CU in the *MeasGapConfig* IE of the *DU to CU RRC Information* IE that is included in the UE CONTEXT MODIFICATION RESPONSE message.   
  And  
  The gNB-DU shall take the received info, e.g. the *measObjectToAddModList* IE, and/or the *measObjectToRemoveList* IE into account, when generating measurement gap and when deciding if a measurement gap is needed or not.
* The gNB-DU is the node deciding whether measurement gaps are needed or not. Namely, when a gNB-DU receives from the gNB-CU a *MeasConfig* IE indicating the need for measurement gaps on certain frequency bands, the gNB-DU decides if such measurement gaps are needed or not and the gNB-DU produces a *MeasGapConfig* IE as a consequence of such decision.
  + If a gNB-DU decides that no measurement gaps are needed, gNB-DU does not generate a *MeasGapConfig* IE
  + If a gNB-DU decides, at any point in time, that measurement gaps are needed it generates a *MeasGapConfig* IE

The understanding above is also confirmed by the fact that the gNB-CU signals to the gNB-DU a *MeasConfig* IE which does not include the details about the Measurement Gap configuration. Namely, the MeasConfig IE signalled from gNB-CU to gNB-DU does not contain the MEasGapConfig IE, which is under the gNB-DU responsibility. This is confirmed by the following semantics in 38.473:

#### 9.3.1.25 CU to DU RRC Information

This IE contains the RRC Information that are sent from gNB-CU to gNB-DU.

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| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| CG-ConfigInfo | O |  | OCTET STRING | CG-ConfigInfo, as defined in TS 38.331 [8]. | - |  |
| UE-CapabilityRAT-ContainerList | O |  | OCTET STRING | This IE is used in the NG-RAN and it consists of the UE-CapabilityRAT-ContainerList, as defined in TS 38.331 [8]. | - |  |
| MeasConfig | O |  | OCTET STRING | MeasConfig, as defined in TS 38.331 [8] (without MeasGapConfig).  For EN-DC/NGEN-DC operation, includes the list of FR2 frequencies for which the gNB-CU requests the gNB-DU to generate gaps.  For NG-RAN,NE-DC and MN for NR-NR DC, includes the list of FR1 and/or FR2 frequencies for which the gNB-CU requests the gNB-DU to generate gaps and the gap type (per-UE or per-FR). | - |  |

From the above, it is clear that, once the gNB-DU generates the *MeasGapConfig* IE, containing the measurement gap configuration, the gNB-CU shall signal it to the UE so to configure the measurement gaps. Failure to do so would generate an out of synch situation between measurement gaps configured at gNB-DU and those configured at the UE.

From the above it can also be understood that the content of the *MeasGapConfig* IE should be transferred transparently by the gNB-CU to the UE. Failure to do so would again create an out of synch situation between measurement gaps configured at gNB-.DU and those configured at the UE.

**In light of the analysis above, companies are invited to provide their comments on whether R3-206809 can be agreed**

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| --- | --- |
| Company | Comment |
| Ericsson | Yes, R3-206809 can be agreed as it clarifies some principles that are implicitly supported in the specifications. |
| Huawei | Not necessary. As E/// also commented, it is already implicitly supported in the spec, not sure if we need to specify everything which actually is clear. MeasGapConfig anyway is generated by DU, and transparently transmitted by CU to UE. |
| Nokia | Not needed. Similarly, we see this proposal as being contradictory to that in R3-206774, mandating to include MeasGapConfig in each configuration query, which in several scenarios would not incur signalling toward the UE, yet contradicts this proposal. |
| Ericsson | We need to clarify that the behaviour we described is obvious to us, but unless it is described in the specifications it will not be clear to all. Why not specifying the behaviour if this is how companies commenting to this discussion believe it is correct?  @Nokia: see comments below explaining why the error mentioned is not applicable. |
| CATT | It is OK to add the description on gNB-CU initiated UE context Modification procedure.However,if the UE context Modification procedure is initiated by gNB-DU,we don't think the change is needed. In the sematic description, it is stated that *MeasGapConfig* would be included in *DU to CU RRC information* only as requested by the gNB-CU via *MeasConfi*g IE. |
| Samsung | Not necessary.  As commented by HW, the current specification already implicitly indicate this. Moreover, the DU to CU RRC Information IE contains several optional IEs; we don’t need to clarify each of them in the specification.  What’s important is that nothing is broken without clarification. |
| ZTE | Similar view with Huawei and Samsung, the correction in R3-206809 seems to be implicit common understanding, not clear whether this should be clarified in the RAN3 specification. |

**Conclusion1: Two companies think that R3-206809 can be agreed. One of these companies thinks that the clarification should not apply to the gNB-DU triggered UE context Modification procedure.**

**Four companies think that the corrections are already implicitly deductible from the current specifications.**

**If companies believe that R3-206809 cannot be agreed, please explain**

* **Why a new MeasGapConfig IE signalled from a gNB-DU to a gNB-CU should not trigger a UE RRC reconfiguration aimed at configuring the measurement gaps**
* **Why a new MeasGapConfig IE signalled from a gNB-DU to a gNB-CU should not be signalled to the UE transparently**

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| --- | --- |
| Company | Comment |
| Huawei | It is clearly specified in RAN2 that only RRC reconfiguration and RRC resume could carry measgapconfig IE, there is no need to repeat in RAN3, and it is common understanding that L1/L2 configurations from DU to CU doesn’t have to be coded by CU. And CU provide measurement object, DU provides gap, not sure if there is anything broken. |
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**Conclusion2: There is no objection to agree to the following principles:**

* **A new MeasGapConfig IE signalled from a gNB-DU to a gNB-CU should trigger a UE RRC reconfiguration aimed at configuring the measurement gaps**
* **A new MeasGapConfig IE signalled from a gNB-DU to a gNB-CU should be signalled to the UE transparently**

## 3.2 Analysis of *MeasGapConfig* IE and the *Configuration Query* IE

In R3-206774 the following change is proposed for section “8.3.4 UE Context Modification (gNB-CU initiated)” of TS38.473:

If the GNB-*DU Configuration Query* IE is contained in the UE CONTEXT MODIFICATION REQUEST message, gNB-DU shall include the *CellGroupConfig* IE and the *MeasGapConfig* IE in the *DU To CU RRC Information* IE in the UE CONTEXT MODIFICATION RESPONSE message.

To understand the rationale behind this change one needs to understand the purpose of the *GNB-DU Configuration Query* IE. This IE is described as follows in TS38.473:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| GNB-DU Configuration Query | O |  | ENUMERATED (true, ...) | Used to request the gNB-DU to provide its configuration. | YES | reject |

Therefore, the GNB-*DU Configuration Query* IE is a tool for the gNB-CU to check on the gNB-DU configuration and eventually identify that there is no out of synch between the gNB-DU configuration known at the gNB-CU and that in place at the gNB-DU.

As per current specifications, the GNB-*DU Configuration Query* IE is used only to request that the gNB-DU reports the *CellGroupConfig* IE. However, as seen in the analysis from section 3.1, the gNB-DU is also responsible for generation of the *MeasGapConfig* IE. Hence it is plausible that the gNB-CU can query the gNB-DU configuration in terms of *MeasGapConfig* IE.

**Conclusion 1: The the GNB-*DU Configuration Query* IE is a tool for the gNB-CU to request the latest gNB-DU configuration information. As gNB-DU is responsible for MeasGapConfig, it is plausible that the the *GNB*-*DU Configuration Query* IE triggers reporting of the *MeasGapConfig* IE too**

Of course, it is obvious that if the gNB-CU requests from the gNB-DU reporting of the CellGroupConfig and MeasGapConfig, via the *GNB-DU Configuration Query* IE, the gNB-CU shall not signal these parameters towards the UE (by means of RRC reconfiguration) unless these parameters are different from those currently configured at the UE.

**Conclusion 2: IF the gNB-CU receives CellGroupConfig and MeasGapConfig as a response to signalling of the the *GNB-DU Configuration Query* IE, the gNB-CU shall not signal these parameters to the UE via RRC reconfiguration unless they are different from those last configured at the UE**

**In light of the analysis above, companies are invited to provide their comments on whether R3-206774 can be agreed**

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| --- | --- |
| Company | Comment |
| Ericsson | Yes, R3-206774 can be agreed as it enalbes the gNB-DU to report its configuration information when the GNB-*DU Configuration Query* IE is received |
| Huawei | Not sure the intention |
| Nokia | Not agreeable. Likewise, it is also non-backwards compatible from a functional perspective. The configuration query has only mandated to include CellGroupConfig in the response thus far. Further, the change proposed in R3-206774 and R3-206809 are linked and incur issues, as a configuration query from a gNB-CU needs not to mandate an RRC reconfiguration toward the UE. |
| Ericsson | Response to Nokia:  As explained, a query where the MEasGapConfig is returned by the gNB-DU will not generate an RRC reconfiguration. We can and should clarify that, also for the case of the Cell Group Config. Note that TS38.473 states the following about the CelGroupConfig:  If the *CellGroupConfig* IE is included in the *DU to CU RRC Information* IE contained in the UE CONTEXT MODIFICATION RESPONSE message, the gNB-CU shall perform RRC Reconfiguration as described in TS 38.331 [8].  However, if the CellGroupConfig is received as consequence of GNB-*DU Configuration Query* IE the gNB-CU would not necessarily signal it to the UE.  Hence, the behaviour we propose is exactly the same as for the CGC. If we need to clarify such behaviours we are open to do so.  Response to Huawei: the intention is to check the latest MEasGapConfig configuration at the gNB-DU, just like the latest CellGroupConfig issued by the gNB-DU can be checked by the gNB-CU. This is because it may happen that CU and DU are out of synch in terms of MEasGapConfig information. For example, if the gNB-DU issues a new MeasGapConfig but the gNB-CU does not receive that message, the two nodes may become un-synched with respect to the content of the MeasGapConfig. |
| CATT | Seems not needed.  The reason we introduce gNB -*DU Configuration Query* IE to request for CellGroupConfig is that it is not mandate for gNB-CU to keep CellGroupConfig.When inter-DU HO condition is triggered for one UE, gNB-CU would request for the latest *CellGroupConfig* and include it in the HO related message to support delta configuration. However,for *MeasGapConfig* information,since it is included in *MeasConfig* IE,it is natural that gNB-CU would always keep the latest configuration. So, it seems that query on *MeasGapConfig* is not necessary. |
| Samsung | Have concerns on the necessity.  Currently, the *GNB-DU Configuration Query* IE is only applicable for CellGroupConfig IE. The revision seems to introduce a new feature for the *GNB-DU Configuration Query* IE. Moreover, such IE is used in case the CellGroupConfig is not kept in gNB-CU side for inter-DU handover case. However, we are not sure whether the gNB-CU needs to be aware of MeasGapConfig during HO case. |
| ZTE | Similar view with majority, seems not needed.  For handover case, the latest CellGroupConfig is needed to support delta configuration, while whether the latest MeaGapConfig is needed is unclear. |

**Conclusion3: the majority of companies has expressed doubts on the use case for which the MeasGapConfig IE needs to be queried by the gNB-CU. It is proposed to continue discussions and to clarify the purpose of the proposal**

**If companies believe that R3-206774 cannot be agreed, please explain**

* **How can a gNB-CU check the latest gNB-DU MeasGapConfig configuration and how to correct eventual out of synch MeasGapConfig configurations between gNB-DU and UE**

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| Company | Comment |
| Huawei | We just don’t understand the purpose of CU's awareness of measurementgap, not sure the benefits? Why measurement gap is needed for handover preparation? |
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|  |  |

**Conclucion4: more discussions are needed to explain the use case for this proposal. It is proposed to continue discussions on this topic**

# 4 Conclusion, Recommendations [if needed]

If needed

# 5 References

[1] R3-206032, Discussion on the MDT for inactive UE (Samsung)

[2] R3-206701, Management based MDT should not overwrite signaling based MDT (ZTE)

[3] R3-206094, Further discussion on MDT configuration overriding issue (Huawei)

[4] R3-206549, Discussion on Signalling and Management based Logged MDT (Ericsson)