3GPP TSG-RAN WG2 Meeting #111e R2-200xxxx

Online, 17th – 28th August 2020

**Agenda Item: 6.9.3**

**Source: MediaTek Inc.**

**Title: [AT111e][502][PowSav] RRC open issues**

**Document for: Discussion and decision**

# 1 Introduction

Following online discussions at R2#111e, we agreed to:

|  |
| --- |
| **Agreements**   * + 1. Use R2-2007576 as the baseline for the running CR for RRC.     2. UAI prohibit timers’ description is updated according to R2-2007809.     3. The field description for maxMIMO-Layers is updated according to R2-2007811.     4. UAI for SCG is included in the HandoverPreparationInformation inter-node message in TS 36.331.     5. Discuss over email to verify these are the correct messages: UAI for SCG is included in CG-Config and CG-ConfigInfo inter-node messages.     6. SCG UAI configuration is released on resuming an RRC connection for a UE configured with (NG)EN-DC     7. Review over email the set of clarifications as proposed in R2-2007814.     8. Clarify in the field description that the UE should send the drxcycle if it is sending drxcycle timer   *Proposals can be agreed by email if the use case is valid.*  *2: Repeat SCG UAI transferred via SRB1 within 1 second prior to synchronous MCG reconfiguration (NR)/ handover (LTE)*  *3: Do not repeat SCG UAI transferred via SRB1 within 1 second prior to synchronous SCG reconfiguration (NR)* |

A draft CR [16] is provided along with this document to capture the agreements above. Some of the changes proposed in R2-2007814 are also included in the draft CR. Companies are encouraged to provide their feedback on the CR.

In this document, we continue the discussion on issues raised in R2-2007232, R2-2006988 and R2-2007904.

# 2 Discussion

## 2.2 R2-2007232: Correction to repetition of SCG UAI

Paper [3] discusses repetition of UE Assistance Information (UAI) for the SCG that was sent 1s prior to a reconfiguration with sync. The behaviour is currently captured as below [15]:

2> if *reconfigurationWithSync* was included in *masterCellGroup* or *secondaryCellGroup*; and

2> if the UE transmitted a *UEAssistanceInformation* message for the corresponding cell group during the last 1 second, and the UE is still configured to provide UE assistance information for the corresponding cell group:

3> initiate transmission of a *UEAssistanceInformation* message for the corresponding cell group in accordance with clause 5.7.4.3;

The paper points out that in the case where SCG UAI is reported using SRB1 (i.e. via the MN), the following issues exist with the current text:

**a) Change of MN**: As per the current text, the UE does not trigger repetition of SCG UAI on SRB1. However it may not possible for the source MN to transfer the information to the target MN, if the SCG UAI is received on the source MN after it has initiated handover preparation request to the target MN. Therefore SCG UAI repetition is essential in this case.

**b) Change of SN**: As per the current text, the UE triggers the repetition of SCG UAI on SRB1. However, it should be possible for the MN to transfer the UAI to the target SN after SN change. Therefore repetition by the UE does not seem essential in this case.

However, one company indicated that when the MN changes, a reconfiguration with sync is needed for the SCG as the security key in the SN needs to be updated. As a result, the SCG UAI repetition will take place eventually, and there is no issue with the scenario a) above.

We need to conclude whether the use-case raised in [3] is valid or not. Companies are requested to provide their feedback below.

*Q1. Does an MN change result in a reconfiguration with sync for the SCG?*

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Justification |
| Google | Yes | We have the same understanding that when the MN changes, a reconfiguration with sync is needed for the SCG due to security key change. Therefore, the current specification already covers scenario a) and nothing is needed. |
| Samsung | Yes | We have identified that MCG change requires change of master key and thus also of secondary key. It means to need a reconfiguration with sync also for SCG, upon MCG change.  Hence, if a reconfiguration with sync for MCG was configured and if UE transmitted SCG UAI via SRB1 (on the MCG) during the last 1 second, the SCG UAI needs to be retransmitted to the target.  On the other hand, we would like to further study if current procedural text is best. We may add a note to make it clear. |
| OPPO | Yes | Agree with Google. |
| Nokia | Yes | Inter MN HO will cause key change. |
| CATT | Yes if bearer requiring SCG radio resources | MN changes require change of master key and secondary key (if needed). And when the UE needs to synchronize to the SN during inter-MN handover with/without SN change is captured In 10.7.1 and 10.7.2 in TS 37.340 as follows:  *9. If configured with bearers requiring SCG radio resources, the UE synchronizes to the (target) SN.*  Hence, during MN change:  - Case 1: The UE is configured with bearers requiring SCG radio sources.  In this case, both MCG reconfiguration with sync and SCG reconfiguration with sync are performed. The UE will repeat its UAI for SCG to target SN due to receive SCG reconfiguration with sync.  - Case 2: The UE is not configured with any bearer requiring SCG radio sources.  In this case, all DRBs and/or SRBs in SN are transmitted via MCG radio resources. No SCG radio resource is configured to the UE. And only MCG reconfiguration with sync is performed. Then according to current TS, the UE will not repeat its UAI for SCG to target SN, even if the UE transmitted UAI for SCG within 1 second prior to synchronous MCG reconfiguration. But it will not result in a problem. UAI for SCG is used to assist SN in configuring appropriate SCG radio resources. However, no SCG radio source is configured to the UE in this case. The target SN doesn’t need or care about UAI for SCG. (The target SN may release UAI configurations for SCG within *RRCReconfiguration* message in advance.) |
| Huawei | Yes | Agree with CATT. |
| vivo | Yes | After further checking, we agree that MN change will also cause the reconfig with sync for SN. In this way, the SCG UAI repetition will take place eventually based on the current specification. |
| Samsung2 | Yes | We like to note that according to current text a change of MN also triggers repetition of power assistance transferred via SRB3. We also think the current wording is not very clear. We thus think it would be good to split the synchronous reconfiguration cases and clarify that in case of synchronous MCG reconfiguration the UE repeats information transferred via SRB1.  One remark in response to CATT: MN provides (updated) secondary key is also so that SN can configure SRB3 |
| Ericsson | Yes |  |
| Intel | Yes | We agree that MN change results in a reconfiguration with sync for the SCG. When MN changes, both the master key (KgNB) and the secondary key (S-KgNB) change, according to TS 38.331 clause 5.3.1.2 “Whenever there is a need to refresh the secondary key, e.g. upon change of MN with KgNB change…”. Then irrespective of whether DRBs served in SN are MN terminated or SN terminated, reconfiguration with sync is needed for SCG due to the security key refresh. |

Scenario b) results in an unnecessary repetition of the SCG UAI on SRB1. Companies are requested to provide their opinion on whether this unnecessary repetition of SCG UAI needs to be prevented.

*Q2. Should the RRC spec be modified to prevent the UE from repeating SCG UAI transferred via SRB1 (i.e. on the MCG) within 1 second prior to reconfiguration with sync on the SCG?*

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Justification |
| Google | Yes | In this case, the reconfiguration with sync on the SCG has no impact to transmission of the SCG UAI via SRB1. The UE should not be required to check the “1 second” condition for this scenario and to retransmit the SCG UAI. |
| Samsung | Yes | UE need not repeat SCG UAI because MCG can again provide the received SCG UAI to the target SCG.  We have assumed that current procedural text should be slightly updated. |
| OPPO | Yes | Agree with the comments above. |
| Nokia | No | This would be optimization and to us nothing is broken. Transfer of the UAI to the target SN may not be supported in the network and therefore repetition of the UAI by UE is needed. |
| CATT | No | We agree that scenario b) results in an unnecessary repetition of the SCG UAI on SRB1. But it will not result in wrong behaviours. In addition, it’s not clear how to modify the RRC spec. The UE needs to consider whether reconfiguration with MCG is received when the UE checks to repeat SCG UAI while SRB3 is not configured. We prefer to keep the description as simple as possible if modification is needed. |
| Huawei | Slightly Yes | We agree there is nothing wrong for the current behaviours. However, if this optimization can be achieved by slightly update, it is ok to us. |
| vivo | Not so strong | We agree the unnecessary repetition will be triggered in this case. But it will not introduce any problem. From our side, either keep it or any update is fine. As CATT said, if we want to change it, we prefer to have simplest way. |
| Samsung2 | Yes | To clarify our intention, we provided a draft CR in the folder in which we clarify that in case of synchronous SCG reconfiguration the UE repeats information transferred via SRB3 (and we propose to adopt similar style for synchronous MCG reconfiguration, see also reply to previous question). |
| Ericsson | No | This is an optimization (for the UE), and not needed. This would imply additional complexity for the NW to implement. |
| Intel | No | We also think this is optimization and will make specification more complex. |

## 2.5 R2-2006988, R2-2007904: Inter-node messaging

Papers [2] and [14] describe the need for including UE Assistance Information in the following inter-node messages to allow exchange of SCG UAI from source SN to target SN via the MN, in case of inter-MN handover with SN change:

1. *CG-Config* in 38.331 (to transfer SCG UAI from source SN to source MN)

2. *CG-ConfigInfo* in 38.331 (to transfer SCG UAI from target MN to target SN)

The introduction of SCG UAI in *CG-Config* and *CG-ConfigInfo* is new behaviour and requires further discussion.

*Q3. In case of an inter-MN handover with SN change, should inter-node messaging be modified to transfer the SCG UAI from the source SN to the source MN? If yes, please indicate the message to be used for the transfer.*

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Yes/No | Message | Justification |
| Google | Yes | CG-Config | Not only for inter-MN handover with SN change but also for SN change without MN change, the source SN should forward the SCG UAI to the target SN via the MN. If the source SN cannot forward the SCG UAI to the target SN, the UE needs to retransmit the SCG UAI after SN change. We prefer that the source SN forwards the SCG UAI to the target SN to avoid the UE needs to retransmit the SCG UAI after SN change.  To support the forwarding of the SCG UAI via the MN, we need to support inclusion of the SCG UAI in the CG-Config, so that the MN can receive the SCG UAI from the source SN. Then the MN can include the SCG UAI in the CG-ConfigInfo in the SN Addition Request for the target SN. In RAN3 specifications, the SN Addition Request includes the CG-ConfigInfo but does not include the CG-Config. Therefore, we also need to support inclusion of the SCG UAI in the CG-ConfigInfo. |
| Samsung | Yes | CG-Config | A New field in CG-Config can be introduced.  Initially, we assumed to use RRC TRANSFER over Xn (please find a table below from TS38.423).  For instance, ULInformationTransferMRDC/DLInformationTransferMDRC are used to carry RRC message to be forwarded to opposite node.  The RRC message included in the ULInformationTransferMRDC/DLInformationTransferMDRC is forwarded over RRC TRANSFER.  In TS38.331, UEAssistanceInformation message is one of them which can be included in ULInformationTransferMRDC.  On the other hand, for minimal impact to RAN3, we can agree to update the inter-node message, CG-Config.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **UE Report** |  | *0..1* |  |  | YES | reject | | >RRC Container | M |  | OCTET STRING | For NGEN-DC and NR-DC, includes the *UL-DCCH-Message* as defined  in subclause 6.2.1 of TS 38.331 [10] containing the *MeasurementReport* message or the *FailureInformation* message.  For NE-DC, includes the *UL-DCCH-Message* as defined in subclause 6.2.1 of TS 36.331 [14] containing the *MeasurementReport* message. | – |  | |
| OPPO | Yes | CG-Config | In order to forward UAI for SCG from source SN to target SN in the case of inter-MN handover with SN change, both inter-node messaging for UAI for SCG from source SN to source MN and inter-node messaging for UAI for SCG from target MN to target SN are needed. |
| CATT | Yes | CG-Config | In order to avoid UE re-transmitting the SCG UAI, the SCG UAI needs to be transferred from the source SN to the (source) MN (i.e. **source SN-> source MN**) in case of both inter-MN handover with SN change and SN change without MN change. Then the SCG UAI is transferred from:   * **Source MN -> target MN** during inter-MN handover, which was already agreed in last meeting; and * **(Target) MN-> target SN** during inter-MN handover with SN change and SN change without MN change, which will be discussed in Q4.   Note other info besides configurations has already been included in CG-Config, e.g. measurement results. Hence the SCG UAI can also be introduced in CG-Config. |
| Huawei | Yes | CG-Config |  |
| vivo | Yes | CG-Config | We agree with above, both MN handover with SN change and SN change without MN change need the transfer for SCG UAI from source SN to source MN, and target MN to target SN, which can be included in CG-Config inter-node message. |
| Ericsson | Yes | CG-Config |  |
| Intel | Yes | *CG-Config* | Agree that the modification of inter-node message is beneficial to reduce the overhead in air interface. |

*Q4. In case of an inter-MN handover with SN change, should inter-node messaging be modified to transfer the SCG UAI from the target MN to the target SN? If yes, please indicate the message to be used for the transfer.*

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Yes/No | Message | Justification |
| Google | Yes | CG-ConfigInfo | Not only for inter-MN handover with SN change but also for SN change without MN change, the source SN should forward the SCG UAI to the target SN via the MN. If the source SN cannot forward the SCG UAI to the target SN, the UE needs to retransmit the SCG UAI after SN change. We prefer that the source SN forwards the SCG UAI to the target SN to avoid the UE needs to retransmit the SCG UAI after SN change.  To support the forwarding of the SCG UAI via the MN, we need to support inclusion of the SCG UAI in the CG-Config, so that the MN can receive the SCG UAI from the source SN. Then the MN can include the SCG UAI in the CG-ConfigInfo in the SN Addition Request for the target SN. In RAN3 specifications, the SN Addition Request includes the CG-ConfigInfo but does not include the CG-Config. Therefore, we also need to support inclusion of the SCG UAI in the CG-ConfigInfo. |
| Samsung | Yes | CG-ConfigInfo | A New field in CG-ConfigInfo can be introduced. |
| OPPO | Yes | CG-ConfigInfo | See our reply to Q3. |
| CATT | Yes | CG-ConfigInfo | See comments in Q3. In order to avoid UE re-transmitting the SCG UAI, the SCG UAI needs to be transferred from the (target) MN to the target SN in case of both inter-MN handover with SN change and SN change without MN change. And some info besides configurations has already been included in CG-ConfigInfo, e.g. measurement results. Hence the SCG UAI can also be introduced in CG-ConfigInfo. |
| Huawei | Yes | CG-ConfigInfo |  |
| vivo | Yes | CG-ConfigInfo | See above. |
| Ericsson | Yes | CG-ConfigInfo |  |
| Intel | Yes | *CG-ConfigInfo* | Agree that the modification of inter-node message is beneficial to reduce the overhead in air interface. |

# 3 Contact information

Please provide your name and email address below, when updating this document.

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# 4 Conclusion

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# 5 References

1. R2-2006688 - Value range for UAI in power saving (vivo)
2. R2-2006988 - Inter-node exchange of UAI for SCG during handover (CATT)
3. R2-2007232 - Repetition of SCG related (power saving) assistance upon synchronous reconfiguration/ handover (Samsung Telecommunications)
4. R2-2007368 - CR for UE assistance information for releasePreference (OPPO)
5. R2-2007576 - Misc. corrections CR for 38.331 for Power Savings (MediaTek Inc.)
6. R2-2007808 - Correction for UAI transmission in NR-DC case (Huawei, HiSilicon)
7. R2-2007809 - Correction on condition of prohibit timer for power saving (Huawei, HiSilicon)
8. R2-2007810 - Correction on field description of preferredDRX-LongCycle (Huawei, HiSilicon)
9. R2-2007811 - Correction on field description of maxMIMO-Layers (Huawei, HiSilicon)
10. R2-2007812 - Correction on other configuration release for SCG (38.331) (Huawei, HiSilicon)
11. R2-2007813 - Correction on other configuration release for SCG (36.331) (Huawei, HiSilicon)
12. R2-2007814 - Corrections on clarificaiton of the cell group specific UE assistance information (Huawei, HiSilicon)
13. R2-2007815 - Discussion on preferredDRX-ShortCycleTimer (Huawei, HiSilicon)
14. R2-2007904 - Add UE assistance information in CG-ConfigInfo (Google Inc.)
15. 3GPP TS 38.331 V16.1.0 - Radio Resource Control (RRC) protocol specification (Release 16)
16. R2-200xxxx – Misc. Corrections CR for 38.331 for Power Savings v2