3GPP TSG-RAN WG2 #115e R2-210xxxx

Electronic Meeting, 16 – 27 August 2021

Agenda Item: 8.2.2.1

Source: Samsung

Title: [AT115-e][220][R17 DCCA] Bearer handling of SCG deactivation (Samsung)

WID/SID: LTE\_NR\_DC\_enh2-Core

Release: Rel-17

Document for: Discussion and Decision

# 1 Introduction

This document is to handle the following email discussion:

* [AT115-e][220][R17 DCCA] Bearer handling of SCG deactivation (Samsung)

Scope:

* + - Discuss the Bearer handling of SCG (de)activation based on online discussion

Intended outcome: Report

* + - Discussion summary in [R2-2108862](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_115-e/Docs/R2-2108862.zip) (by email rapporteur).

Deadline for providing comments, for rapporteur inputs, conclusions and CR finalization:

* + - Initial deadline (for company feedback): 1st week Fri, UTC 0900
    - Initial deadline (for rapporteur summary): 2nd week Mon, UTC 1000

The following document is to be treated in this email discussion:

Web Conf (Tuesday 1st week), Bearer handling (1)

UP details: Bearer handling for SCG deactivation

[R2-2107669](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_115-e/Docs/R2-2107669.zip) Bearer handling for SCG deactivation Samsung discussion Rel-17 LTE\_NR\_DC\_enh2-Core

* Discuss bearer handling in deactivated SCG (e.g. proposals in [R2-2107669](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_115-e/Docs/R2-2107669.zip)) in offline [220] (Samsung)

2 Contact Information

The rapporteur encourages the delegates who provide input to provide their contact information in the below table:

|  |  |
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# 3 Discussion

## 3.1 SRB3 handling for deactivated SCG

For deactivated SCG, it is straightforward to maintain SRB1 for MCG link. However, we may need to discuss whether to keep SRB3 or not, if configured. Considering the previous agreements, keeping SRB3 alive would not have any benefit. In this regard, it would be reasonable to suspend SRB3 upon SCG deactivation.

**Proposal 1. SRB3 is suspended upon SCG deactivation, if configured.**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| LG | Disagree | We don’t see the need to suspend RBs (including SRBs and DRBs) at SCG deactivation, because the UE anyway cannot transmit the data to SCG. It does not give any harm to keep the SRB3 alive. |
| MediaTek | Agree | We don’t why keeping SRB3 active while actually it cannot transmit/receive. There should be no case that UE has to trigger SCG activation due to data arrival from SRB3? |
| Ericsson | Disagree | It is not clear what it means here: PDCP entity associated with SRB3 is suspended or the SCG transmission is suspended as in SCG failure information procedure. Since PDCP entity suspend (which initializes the counter) would lead to keystream re-use issue (see questions related with from P6 to P9 below), we prefer to have a precise wording. In this case, it should be  suspend SCG transmission for all DRBs/SRBs as in SCG failure information procedure. |
| OPPO | Agree | If SCG is deactivated, no reason and no necessary to keep SRB3 alive. Anyway, the SRB3 will be resumed or removed when SCG is activated. |
| Nokia | Agree | Alternative cumbersome solution would be to never have SRB3 for deactivated SCG. But we prefer suspension. Maybe formulation of proposal could be more like suspend SCG transmission for DRBS/SRBs as in SCG failure information procedure – This to ensure we do not need re-specify something that is already in the specs (or at least we can just copy-paste procedure) |
| Samsung | Agree | Based on previous agreements, the signaling for SCG activation and deactivation would be transmitted via MCG. Keeping SRB3 alive would not be beneficial.  The intention of this proposal is not about “PDCP suspend”. After agreeing to suspend all DRBs and SRBs for SCG, we can say “SCG transmission is suspended”. |
| Apple | Yes and see comments | If SRB3 is kept active, RRC layer would not prevent RRC messages (measurement report, UAI message, etc) passing to PDCP layer, leading to unnecessary SCG activation request.  Else if SRB3 is suspended upon SCG deactivation, it means that UE can only resume by itself in order to transmit MCGFailureInformation message in SCG deactivated state.  Thus, we feel it’s better to keep SRB3 suspended, rather than active. |
| Futurewei | Agree | After SCG deactivated, with the control and traffic channels for the SCG are suspended no way to keep SRB3. |
| Huawei, HiSilicon | SRB3 should not be used but | we agree with Ericsson that we could reuse the same like for SCG RLF.  That said, it could be sufficient to only add in 38.331 in the measurement reporting "and the SCG is not deactivated" after "if SRB3 is configured", then there is no use to specify that SRB3 is suspended (and anyway, this does not exist now and there is no handling for it). |
| Qualcomm | Agree | Since there is no RRC message to be transmitted over the SCG during deactivated, SRB3 should be suspended. |
| Lenovo, Motorola Mobility | Disagree | Similar view as Ericsson and Huawe, it seems enough to say the SCG tranmsision is suspended.  If the whole SRB3 is suspended, then it comes to the question whether/how to handle the generated packets. Also, in case of UE triggered rachless SCG activation upon UL data arrival, UE might send a SR to NW directly, meaning UE will resume the SRB3 by itself first before the SR is generated, which seems a bit odd. |
| Spreadtrum | Agree | When SCG is deactivated, no need to keep SRB3 alive. The SCG activation/deactivation command is transmitted through MCG. |
| China Telecom | Agree | It is agreed that only the MN can generate an RRC message with SCG activation and deactivation. And the MN RRC reconfiguration message can reconfigure any parameter when the SCG is deactivated. Therefore, SRB3 should be suspended upon SCG deactivation. |
| vivo | Agree but | Prefer the wording proposed by Ericsson. |
| Sharp | See comments | If RB(including SRB and DRB) is not released upon SCG deactivation, RB should not be used during SCG deactivation even if RB is configured. This need to be achieved by "suspend". But we are not sure if there is any different effect between "suspend" and "release". Also, we wonder if it is better to use either "suspend RB" or "suspend SCG transmission". |
| DOCOMO | Agree |  |
| DENSO | Disagree | Same with as LG, Ericsson, Huawei and Lenovo. SRB1/2 can be used anyway, while SCG is deactivated. |
| Intel | Disagree | The intention is ok. Regarding how to capture it in the specification, Nokia’s way is ok, i.e. suspend SCG transmission for DRBS/SRBs as in SCG failure information procedure. |
| CATT | Agree | Only support transmission over SRB1 while SCG is deactivated. SRB3 can either be released or resumed when SCG is activated. |
| ZTE | Disagree | Prefer the wording proposed by Ericsson. |

Summary: 14 companies agreed to this proposal while 6 companies disagreed to it. 7 out of 20 companies preferred different wording, e.g. suspend SCG transmission for SRB3.

In legacy, we have similar concepts to SCG deactivation, i.e. RRC INACTIVE state and SCG failure.

For RRC INACTIVE state, the UE goes to RRC INACTIVE state due to network decision, which assumes the network ensures no data transmission/reception. When UE goes to RRC INACTIVE state, UE “suspends all SRBs and DRBs except SRB0”. UE stays in RRC INACTIVE state before the need of RRC resumption, e.g. DL/UL arrival or RNA update and so on. The need of RRC resumption triggers RRC resume procedure and then UE resumes suspended SRBs and DRBs upon the reception of RRCResume message and restart data transmission/reception.

For SCG failure, the UE triggers SCG failure information procedure due to radio link problem. Upon detection of radio link failure, UE declares SCG RLF and thus “suspend SCG transmission for all SRBs and DRBs”. Note that this case always makes the network and UE try to have a connection again since there may be on-going data transmission and the unexpected RLF is detected, i.e. it is not based on network decision. My understanding is that “suspend SCG transmission for all SRBs and DRBs” means temporary suspension and transmission to be re-started right after RLF.

In this reason, Rapporteur suggest the following proposal but the wording can be discussed, if needed.

**Proposal 1. Suspend SRB3 upon SCG deactivation, if configured.**

One thing is to be noted that RRC messages may be generated to be transmitted via SRB3 before the reception of SCG deactivation indication. In this case, they may be transmitted later upon SCG activation, which should be avoided. The network may release SRB3 upon SCG deactivation. However, mandating the network to release it would not be a good way. This issue is about the case that SRB3 is suspended.

**Proposal 2. For SRB3, the old RRC message is discarded upon SCG deactivation, if any.**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| LG | Agree | Agree, however, we think this issue is not related to SRB suspension. The PDCP SDUs/PDUs of SRBs can be discarded by discard timer or request by RRC, even if the PDCP entity is not suspended. |
| MediaTek | Agree |  |
| Ericsson | Disagree | The principle looks okay for UE-initiated RRC message, like measurement report.  Question is whether this is needed to be agreed and if so, how to capture in the spec. There can be many corner cases due to race conditions. Our view is that there is no need to specify and can be left for UE implementations to discard. |
| OPPO | Agree | For my understanding, it is corner case that there is RRC signaling generated in SCG because the MN and SN will decide to deactivate the SCG together. Anyway, if the RRC message is generated in SCG side, it is better to discarded. |
| Nokia | Disagree | This seems something that does not need to be specified. We see regular suspension as specified currently is sufficient |
| Samsung | Agree | We already have similar behavior to discard old RRC messages in 38.331, e.g. DAPS fallback case. |
| Apple | Agree |  |
| Futurewei | Disagree | Don’t see an issue here. If the UE receives the SRB3 RRC message before the deactivation, the UE shall apply the RRC message. After the SCG is activated again, if the UE receives a RRC message, how the UE would know it is a valid new RRC message or a out dated one? The network implementation should send the valid RRC message to the UE after the activation. |
| Huawei, HiSilicon | Disagree | If any reconfiguration is ongoing, the UE should send the reconfiguration before going to SCG deactivated state.  Besides that, the only case is measurement report, this is a corner case and it seems obvious that it needs to be sent on SRB3 rather than discarded. |
| Qualcomm | Agree |  |
| Lenovo, Motorola Mobility | Disagree | We also don’t see the necessity to specify discarding the data in the buffer upon SCG deactivation. |
| Spreadtrum | Disagree | No need to specify anything. |
| China Telecom | Agree | When the SCG is deactivated, RRC message should not be transmitted through the SCG. Therefore, SRB3 should be suspended. |
| vivo | Disagree | No need to specify anything. This can be left to network and UE implementation. |
| Sharp | Disagree | Confliction between measurement report and SCG deactivation would be a rare case. Therefore, it need not to be specified. However, UE implementation need to make sure that UE will not trigger SCG activation by such erroneous RRC message. |
| DOCOMO | Agree |  |
| DENSO | Disagree | Can be left to NW/UE implementation. |
| Intel | Agree | Same view as Samsung, We already have similar behavior to discard old RRC messages in 38.331, e.g. DAPS fallback case. We may update the proposal a bit, “For SRB3, the old RRC message is discarded after SCG has been deactivated, if any.”  The agreement for DAPS is  RRC S2.3-8-1: When resume SRB upon DAPS HO failure, the old stored RRC message if any, (i.e.. the PDCP PDUs for SRB) shall be discarded;  As captured in 5.3.5.8.3  3> for each SRB:  4> if the *masterKeyUpdate* was not received:  5> configure the PDCP entity for the source PCell with state variables continuation as specified in TS 38.323 [5], the state variables as the PDCP entity for the target PCell;  4> release the PDCP entity for the target PCell;  4> release the RLC entity as specified in TS 38.322 [4], clause 5.1.3, and the associated logical channel for the target PCell;  4> trigger the PDCP entity for the source PCell to perform SDU discard as specified in TS 38.323 [5]; |
| CATT | Agree | If any RRC message is generated or pending transmission at deactivated SCG side, those should be discarded at SCG activation. |
| ZTE | Agree |  |

Summary: 11 companies agreed to this proposal while 9 companies disagreed to it.

This issue mainly resulted from UL RRC message, e.g. measurement report. In Rel-16 DAPS, RAN2 had similar discussion and finally specified it in 38.331.

For SCG deactivation, there may be two issues:

* The first issue is that such UL RRC message can be generated or submitted to PDCP entity upon the reception of SCG deactivation indication. In this case, the RRC message may trigger UE-initiated SCG activation request procedure, which need to be avoided.
* The second issue is that such UL RRC message can be forwarded to RLC entity upon the reception of SCG deactivation indication. In this case, the old RRC message may be transmitted upon SCG activation, which includes outdated information.

Rapporteur suggests these issues online due to no clear majority:

**Proposal 2. Discuss if the old RRC message for SRB3 is discarded after SCG has been deactivated, if any.**

## 3.2 DRB handling for deactivated SCG

For split DRB and duplication DRB, SCG RLC bearer would not be used for data transmission and reception when SCG is deactivated and thus it seems straightforward to suspend SCG RLC bearers of split DRB and duplication DRB, if configured, while the PDCP entities associated to such DRBs continue to perform transmit/receive operation to maintain MCG RLC bearers. Other than spilt DRB and duplication DRB, the normal SCG DRBs would be suspended upon SCG deactivation. The network may release the SCG RLC bearers and SCG DRBs upon SCG deactivation. However, mandating the network to release them would not be a good way.

**Proposal 3. The SCG RLC bearer of split DRB and duplication DRB is suspended upon SCG deactivation, if configured.**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| LG | Disagree | Same comment as in our response for P1.  Suspension/resumption is not needed since RAN2 already agreed that the UE can initiate SCG activation if needed. In addition, if we agree to suspend split DRB/ duplication DRB, the UE may need to perform autonomous bearer relocations whenever there is UL data to transmit via the split DRB/ duplication DRB until SCG is activated. However, this isn’t needed since RAN2 already agreed that the UE can initiate SCG activation if needed.  We don’t see the need to suspend RBs (including SRBs and DRBs) at SCG deactivation, because the UE anyway cannot transmit the data to SCG. It does not give any harm to keep the SRB3 alive. |
| MediaTek | Agree | We assume suspend here only imply that no data transmission to SCG RLC bearer for split/duplication DRB. UE initiated SCG activation is still under discussion. We think that data arrival in duplication DRB does not trigger the UE initiated SCG activation procedure. |
| Ericsson | Disagree | We can use the same formulation as during SCG failure, i.e., SCG transmission of split DRBs is suspended.  The intention is to re-use the existing procedure and minimize spec impacts. Additionally, it is not clear what it means by RLC bearer suspension and there is no need to consider the duplication DRB which is a subcase of split DRB. |
| OPPO | Disagree | For my understanding, there is no data reception and transmission in RLC bearer of split DRB or DRB with DC based PDCP duplication and it may result in SCG deactivation. The SCG deactivation will not force to suspend RLC bearer of split DRB or DRB with DC based PDCP duplication. The SCG deactivation will not impact the QOS of the DRBs.  **The SCG can be deactivated only when all SCG RLC bearers are not used and SCG should be activated if at least one SCG RLC bearer is used.**  However, if primary leg is not in SCG side and if data volume is lower than the configured threshold, i.e *ul-DataSplitThreshold*, the SCG RLC bearer will not be used.   |  | | --- | | - if the total amount of PDCP data volume and RLC data volume pending for initial transmission (as specified in TS 38.322 [5]) in the primary RLC entity and the split secondary RLC entity is equal to or larger than *ul-DataSplitThreshold*:  - submit the PDCP PDU to either the primary RLC entity or the split secondary RLC entity;  **====omit some text**  - else:  - submit the PDCP PDU to the primary RLC entity. |   However，the data volume changes will results in ping-pong SCG activation/deactivation request.  So we propose here:  **For each split bearer, if data volume is lower than the configured threshold, i.e *ul-DataSplitThreshold* and the primary leg is not in SCG side, the SCG RLC bearer will not be used, but SCG cannot be suspended in this case.** |
| Nokia | Maybe | We assume similar suspension can be done as specified already now for SCG failure - maybe this is also the intention of proposal? |
| Samsung | Agree | Suspension means no data transmission and reception as we have in RRC spec. UE initiated SCG activation would be triggered by data volume indication.  In my understanding, we would use the sentence like “transmission is suspend” for cell group level. |
| Apple | Agree | We think it’s straightforward to stop transmission over SCG RLC bearer upon SCG deactivation. SCG RLC bearer can be only resumed once SCG is activated. |
| Futurewei | Agree with clarification | Based on the clarification from the rapporteur that the suspension in terms of no data TRX on the split bearer with deactivated SCG. The configuration of the split bearer is still valid. Therefore, it is reasonable. |
| Huawei, HiSilicon | Not sure | There is no existing text in 38.331 in which an RLC bearer is suspended, this would be new.  Isn’t it simpler to specify that SCG transmission is suspended? Anyway, in DL the UE does not monitor PDCCH so nothing will be received. |
| Qualcomm | Agree |  |
| Lenovo, Motorola Mobility | Disagree | Similar view as for P1, it’s enough to say the SCG transmission is suspended upon SCG deactivation. |
| Spreadtrum | Agree | When SCG is deactivated, the SCG transmission is not allowed. Then SCG RLC bearers of split DRB and duplication DRB are suspended. |
| China Telecom | Agree | Once the SCG is deactivated, the transmission over the SCG RLC bearer should be suspended. |
| vivo | Agree but | Prefer to use the wording “suspend SCG transmission for all DRBs/SRBs.”. |
| Sharp | Agree | Same view as MediaTek. We also think that suspension here only imply that no data transmission to SCG RLC bearer for split/duplication DRB. We need to discuss how to describe them in the spec. |
| DOCOMO | Agree | UE initiated SCG activation would be triggered by data volume indication and so on. |
| DENSO | Disagree | Similar view to the other companies answered as “disagree” or “not sure”. It is enough just to define the UE behaviour that SCG transmission is suspended. In case of split bearer, the UE can transmit data over MCG anyway, even though SCG is deactivated, no matter where is the primary data path.  On the packet duplication, similar the the SCell deactivation, the network should ensure that the duplication is deactivated, when SCG is deactivated. |
| Intel | Disagree | Tend to agree Ericsson’s wording “SCG transmission of split DRBs is suspended. ” |
| CATT | Agree | We assume that suspend here means data transmission suspension over SCG. |
| ZTE | Disagree | Prefer the wording proposed by Ericsson. |

Summary: 11 companies agreed to this proposal while 7 companies disagreed to it. 2 companies are not sure about this. Rapporteur suggest to discuss Proposal 3 and 4 together after rephrasing them.

**Proposal 4. The normal SCG DRB is suspended upon SCG deactivation, if configured.**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| LG | Disagree | Same comment as in our response for P1 |
| MediaTek | To Discuss | If SCG DRB is still configured after SCG deactivation, we need discuss how to handle this while there is UL data arrival. |
| Ericsson | Disagree | Whether the SCG DRB would be supported or not is still under discussion. If it were supported, then the principle makes sense, but we have the comments as above that it is the transmission on SCG that is suspended not the bearer itself. |
| OPPO | Agree | It is obvious action due to SCG deactivation. |
| Nokia | Disagree | If there would be data to be sent on SCG DRB then UE initiates SCG activation procedure. Isn’t this already agreed or is the intention to revert this decision? And argument that there would be data on deactivated SCG at point of deactivation would be just showing that this is bad NW implementation. No need to cover cases when NW deactivates SCG with data on normal SCG DRBs. |
| Samsung | Agree | We think that UE initiated SCG activation is not related to suspension of DRB. If there would be data to be sent on SCG DRB, then the PDCP entity will indicate the data volume to lower layer, which is the same as that of RRC INACTIVE state.  Our understanding is that one of the benefit of SCG deactivation is to keep SCG configuration. So, there would be a case to maintain normal SCG DRB configuration unless we do mandate the network to always release them upon SCG deactivation.  In the similar reason, we think that UE suspends configured DRBs when going to INACTIVE state in legacy. |
| Apple | Disagree | First, we don’t see too many differences between keeping SCG bearer active and suspended.  Then, regarding suspended SCG bearer, as illustrated in R2-2107605, our concern is if we allow SCG DRB to maintain after SCG is deactivated, how should UE behave once UL data is generated. For example, if UE can trigger SCG activation request for every UL data packet, it could lead to frequent unnecessary SCG activation. On the other hand, if UE needs to accumulate the UL data volume to a threshold, latency for data transmission may get very long.  Thus, our preference is to remap the SCG bearer to split bearer or MCG bearer upon SCG deactivation, to make our life easier. |
| Futurewei | Agree with clarification | Normal SCG DRB data TRX should be suspended, not the configured DRB itself. DRB data TRX is resumed after the SCG activation including the UE initiated activation. |
| Huawei, HiSilicon | Not sure | It would be strange to suspend only SCG DRBs. As commented before, suspension of SCG transmission sounds simpler. |
| Qualcomm | Agree |  |
| Lenovo, Motorola Mobility | Disagree | Similar view as for P1, it’s enough to say the SCG transmission is suspended upon SCG deactivation. |
| Spreadtrum | Agree | SCG transmission is not allowed when SCG is deactivated. The handling of UL data arrival of SCG bearer can be discussed to avoid frequently activation/deactivation SCG and data transmission delay. |
| China Telecom | Agree | It is straightforward to suspend the normal SCG DRBs when SCG is deactivated. |
| vivo | Agree but | Prefer to use the wording “suspend SCG transmission for all DRBs/SRBs.”. |
| Sharp | To Discuss | If SCG DRB is suspended, it is not clear how UE behaves when UL data arrival occurs. So, we need to discuss whether/how to detect the UL data arrival during SCG deactivation first and then decide how to treat the SCG DRB. |
| DOCOMO | Agree |  |
| DENSO | Disagree | Similar to Q3, it is enough to specify that SCG transmission is suspended. As Nokia commented, for the normal SCG DRB (i.e. MN/SN terminated SCG bearer), SCG activation should be triggered if there is UL data to be delivered over the SCG bearer. |
| Intel | Disagree | Tend to agree Ericsson’s wording “SCG transmission of SCG DRBs is suspended. ” |
| CATT | Agree | Firstly we want to clarify what “normal SCG DRB” refers to. Does that only means the SN terminated SCG RLC bearer? How about the MN terminated SCG RLC bearer/SN terminated MCG RLC bearer? Anyway We think that this is similar behaviour to the DRB suspension when the UE moving to RRC\_Inactive state, i.e. configuration is kept but UL transmission over the bearer is suspended. All the SCG RLC bearer transmissions are suspended. |
| ZTE | Disagree | Prefer the wording proposed by Ericsson. |

Summary: 9 companies agreed to this proposal while 8 companies disagreed to it. 7 companies preferred different wording. As mentioned in Proposal 1, the wording can be discussed. The majority have the common understanding that there would be no data transmission and reception for deactivated SCG. However, how to handle the bearer seems diverging. The rapporteur suggest to discuss the following proposals:

**Proposal 3. Discuss how to handle SN terminated bearer upon SCG deactivation:**

* **Option 1: Suspend SN terminated bearer upon SCG deactivation, if configured.**
* **Option 2: Network ensures that SN terminated bearer is not configured before/upon SCG deactivation.**
* **Option 3: SN terminated bearer is kept alive upon SCG deactivation, i.e. do nothing.**

**Proposal 4-1. Discuss how to handle SCG RLC bearer of MN terminated bearer upon SCG deactivation:**

* **Option 1: Suspend SCG RLC bearer of MN terminated bearer upon SCG deactivation, if configured.**
* **Option 2: Network ensures that SCG RLC bearer of MN terminated bearer is not used before/upon SCG deactivation, e.g. reconfiguration to another bearer or release or *ul-DataSplitThreshold* with infinity value and primary path to MCG.**
* **Option 3: SCG RLC bearer of MN terminated bearer is kept alive upon SCG deactivation, i.e. do nothing.**

**Proposal 4-2. Discuss how to handle SCG RLC bearer(s) of duplication bearer upon SCG deactivation:**

* **Option 1: Suspend SCG RLC bearer(s) of duplication bearer upon SCG deactivation, if configured.**
* **Option 2: Network ensures that SCG RLC bearer(s) of duplication bearer is not used before/upon SCG deactivation, e.g. deactivation of PDCP duplication.**
* **Option 3: SCG RLC bearer(s) of duplication bearer is kept alive upon SCG deactivation, i.e. do nothing.**

## 3.3 PDCP operation for deactivated SCG

If the network always updates the security key upon SCG activation from deactivation, i.e. sk-counter, there would be no security issue and RLC/PDCP re-establishment would be triggered accordingly, which makes PDCP operation simple. However, there seems no reason to mandate the security key update for SCG activation case, given that the security key update is optional in NR handover unlike LTE handover.

**Proposal 5. The security key update is up to network implementation upon SCG activation from deactivation.**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| LG | Agree |  |
| MediaTek | Agree |  |
| Ericsson | Agree |  |
| OPPO | Disagree with comments | For RRC\_INACTIVE state, after each activation from RRC suspend, the key will be update based on Horizontal derivation or vertical derivation based on availability of new NCC.  We are not sure if there is security risk if the SCG key is not update after SCG reactivation.  **Send LS to SA3 whether the S-KgNB should be update when the SCG is activated.** |
| Nokia | Agree |  |
| Samsung | Agree | As in legacy, the security key should be updated if SCG is activated after SCG change. If SCG is activated for the same SCG, it would be the same as intra-gNB handover without security key update, which is up to network decision. |
| Apple | Agree | During the deactivation interval, if there is no key update on MN, we don’t see the need to update the SN key upon SCG activation from deactivation. |
| Futurewei | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Qualcomm | Agree |  |
| Lenovo, Motorola Mobility | Agree |  |
| Spreadtrum | Agree |  |
| China Telecom | Agree |  |
| Vivo | Agree |  |
| Sharp | Agree |  |
| DOCOMO | Agree |  |
| DENSO | Agree |  |
| Intel | Agree |  |
| CATT | Agree |  |
| ZTE | Agree |  |

Summary: 19 companies agreed to this proposal while 1 companies disagreed to it.

**Proposal 5. The security key update is up to network implementation upon SCG activation from deactivation.**

If we apply the same principle as that of legacy handover to SCG deactivation/activation, it seems straightforward to handle DRB based on the security key update as follows:

**Proposal 6. The normal SCG DRB is resumed after RLC/PDCP re-establishment upon SCG activation, if security key is updated.**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| LG | Disagree | As explained in P1, we don’t see the need to suspend RBs (including SRBs and DRBs) at SCG deactivation. Then, there is no need to resume DRBs. |
| MediaTek | To Discuss | We would like to clarify that whether the NW will set the re-establishment flag (*reestablishPDCP* and *reestablishRLC*) in this case (Assuming YES). Or the UE has to perform the re-establishment no matter the flag is set or not? |
| Ericsson | Disagree | We believe that there is no need to suspend DRB/SRBs and so there is no need to agree on the resume part.  In addition, it is already agreed that key refresh requires PDCP/RLC re-establishment and valid for all DRBs. |
| OPPO | To Discuss | If the SCG activation is sent via RRC signaling, the RRC signaling may set he reestablished indication of PDCP and RLC respectively and UE will follow the indication from network.  If the SCG activation command is sent via L2, the UE will perform RLC/PDCP re-establishment self.  PDCP re-establishment is FFS. |
| Nokia | Maybe | Wouldn’t this be part of the existing configuration? So up to network to ensure re-establishment is done if required. |
| Samsung | Agree | The intention is to have the common understanding for UE and network behavior as that of legacy. |
| Apple | See comments | If RAN2 ever agrees the suspension on SCG DRB, we suppose this proposal is true. |
| Futurewei |  | It appears the legacy behaviour for security key update. |
| Huawei, HiSilicon | Disagree | We think there is not need to suspend the DRB |
| Qualcomm | Agree | As mentioned, this is in alignment with the principle that if SN key update is indicated in the SCG activation message, RLC/PDCP should be re-established for SN terminated bearers. |
| Lenovo, Motorola Mobility | Disagree | Depends on the discussion about DRB suspension upon SCG deactivation, there seems no need. |
| Spreadtrum | Agree | It’s the legacy behaviour. |
| China Telecom | Agree | If the suspension of DRB is agreed, it makes sense to resume the DRBs upon SCG activation. |
| vivo | Agree |  |
| Sharp | Disagree | We assume that security key update and SCG activation are indicated at the same time, so no special handling is needed at UE side. |
| DOCOMO | Agree | It’s the legacy behaviour. |
| DENSO | Disagree | As commented to the other questions, the normal SCG DRB does not have to be suspended. |
| Intel | Disagree | The SCG transmission should be resumed after RLC/PDCP re-establishment upon SCG activation, if security key is updated. |
| CATT | See comment | If the security key is updated upon activation of the SCG and the SCG activation command is sent to the UE via RRC signalling, it is up to NW to set the PDCP/RLC reestablishment flag. The UE just performs according to NW configuration. Otherwise (SCG activation command sent via L2/L1) the UE should perform PDCP/RLC reestablishment itself according to the updated key.  But we don’t see that essential to update the key when NW activate the SCG without SN change, even though whether to update SCG key is up to NW implementation. Therefore we prefer that if the NW command the UE to update the SCG key upon SCG activation, RRC signalling should be used, and UE perform PDCP/RLC reestablishment according to the NW indication. |
| ZTE | See comment | Agree with the intention, if security key is updated, network will set those flags, and UE just follows.  Better to use “SCG transmission is resumed”. |

Summary: 6 companies agreed to this proposal, 7 companies disagreed to it, and 7 companies thought further discussion is needed.

**Proposal 7. The normal SCG DRB is resumed without RLC/PDCP re-establishment upon SCG activation, if security key is not updated.**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| LG | Disagree | As explained in P1, we don’t see the need to suspend RBs (including SRBs and DRBs) at SCG deactivation. Then, there is no need to resume DRBs. |
| MediaTek | To Discuss | We would like to clarify that whether the NW will set the re-establishment flag (*reestablishPDCP* and *reestablishRLC*) in this case (Assuming NO). |
| Ericsson | Disagree | See above, even though we agree that RLC/PDCP re-establishment is not needed if security key is not updated (which is already agreed before). |
| OPPO | To Discuss | If the SCG activation is sent via RRC signaling, the RRC signaling may set he reestablished indication of PDCP and RLC respectively and UE will follow the indication from network.  If the SCG activation command is sent via L2, the UE will perform RLC/PDCP re-establishment self. Anyway, the UE will also initialize the PDCP/RLC state variables when SCG is activated even if there is no security key update.  PDCP re-establishment is FFS. |
| Nokia | Maybe | Wouldn’t this be part of existing configuration? So up to network to ensure re-establishment is done if required. |
| Samsung | Agree | The intention is to have the common understanding for UE and network behavior as that of legacy. |
| Apple | See comments | If RAN2 ever agrees the suspension on SCG DRB, we suppose this proposal is true. |
| Futurewei |  | It is a legacy behaviour. |
| Huawei, HiSilicon | Disagree | Agree with Ericsson |
| Qualcomm | Agree |  |
| Lenovo, Motorola Mobility | Disagree | Depends on the discussion about DRB suspension upon SCG deactivation, there seems no need. |
| Spreadtrum | Agree | It’s the legacy behaviour. |
| China Telecom | Agree | If the suspension of DRB is agreed, it makes sense to resume the DRBs upon SCG activation. |
| vivo | See comments | Prefer the wording “upon the reception of SCG activation indication, the UE resumes the SCG transmission for all DRB and SRB”.  FFS: whether the UE is allowed to resume the SCG transmission for all DRB and SRB upon UE initiating SR/RACH towards SCG for SCG activation. |
| Sharp | Disagree | We assume that security key update and SCG activation are indicated at the same time if the security key update is needed, so no special handling is needed at UE side. |
| DOCOMO | Disagree |  |
| DENSO | Disagree | As commented to the other questions, the normal SCG DRB does not have to be suspended. |
| Intel | Disagree | The SCG transmission should be resumed without RLC/PDCP re-establishment upon SCG activation, if security key is not updated.. |
| CATT | agree | Firstly we want to clarify what “normal SCG DRB” refers to. Does that only means the SN terminated SCG RLC bearer? How about the MN terminated SCG RLC bearer/SN terminated MCG RLC bearer?  For the PDCP that associated with the MCG RLC bearer, it should be active even though the SCG in deactivation state. As for PDCP only associated with SCG RLC bearer, if the PDCP is re-established without key update, it may lead to secourity issues. Our view is that the PDCP doesn’t need to be re-established without key update.  As for the RLC, we should discuss whether it is essential to re-establish RLC, considering the smart NW will send the SCG to be deactivation state when there is no on-going data transmission on SCG side or reconfigure the bearer having on-going data transmission to MCG. It should not have timers or variables issue that need to be reset. Therefore we don’t find the essential to re-establish RLC. If this issue exists, RLC reestablishment should be performed. |
| ZTE | See comment | Agree with the intention, if security key is not updated, network will not set those flags, and UE just follows.  Better to use “SCG transmission is resumed”. |

Summary: 5 companies agreed to this proposal, 8 companies disagreed to it, and 7 companies thought further discussion is needed. Proposal 6 and 7 are related to Proposal 3. So, the rapporteur suggests the following proposals:

**If suspension of SN terminated bearer is agreed in Proposal 3, then RAN2 discuss the following proposals:**

**Proposal 6. Resume SN terminated bearer after RLC/PDCP re-establishment (e.g. based on *reestablishRLC* and *reestablishPDCP* indicators) upon SCG activation, if security key is updated.**

**Proposal 7. Resume SN terminated bearer without RLC/PDCP re-establishment (e.g. based on *reestablishRLC* and *reestablishPDCP* indicators) upon SCG activation, if security key is not updated.**

When UE receives the indication of SCG deactivation, the transmitting PDCP entity with PDCP discard timer configured with infinity may still have PDCP PDUs which have not been acknowledged by lower layers. In this case, such old PDCP PDUs may not be discarded until released and retransmitted later upon SCG activation.

In the early stage of NR, RAN2 had similar discussion for the case that UE goes to RRC INACTIVE state and finally specified the corresponding behavior in 38.323 as follows:

|  |
| --- |
| 5.1.4 PDCP entity suspend  When upper layers request a PDCP entity suspend, the transmitting PDCP entity shall:  - set TX\_NEXT to the initial value;  - discard all stored PDCP PDUs; |

**Proposal 8. The transmitting PDCP entity of the normal SCG DRB discards PDCP PDUs upon SCG deactivation.**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| LG | Disagree | We think PDCP operation should not be affected by SCG deactivation. There is no harm to keep the PDCP entity alive. |
| MediaTek | To Discuss | It seems that a little bit strange to put SCG to deactivated state while there data ongoing on SCG DRB. But if yes, we think this is correct behavior. |
| Ericsson | Disagree | We consider this as a corner case and no need to discuss.  This is for SCG DRBs, and so the network would not de-activate the SCG unless it is certain that there is no ongoing data transmission from the SCG. In other words, there won’t be any PDCP PDUs which have not been acknowledged by lower layer.  Also, it is not clear for us if the proposal also means that the TX counter is reset. If so, then there is the key stream re-use issue. The proposal seems to be related with RRC\_INACTIVE which, upon resume, requires key update and so no key stream re-use issue. |
| OPPO | To Discuss | For SCG deactivation case, only SCG RLC bearer is suspended and the PDCP will not be suspended. E,g, for SN terminated MCG bearer, the PDCP in SCG side cannot be suspended. We can use the uniform rules for all PDCP in SN side. |
| Nokia | - | No need to discuss until we have decided whether we suspend |
| Samsung | Agree | We have the same issue when the network sends UE to RRC INACTIVE state. Even if there is no on-going data on SCG DRB, the transmitting PDCP entity can have PDCP PDUs not acknowledged by the lower layer after final transmission. Note that PDCP discard timer can be configured with infinity. In PDCP point of view, PDCP PDU is discarded only when discard timer is expired or PDCP status report is received.  In this proposal, nothing is to say about COUNT reset. As described in this contribution, we mentioned that COUNT value should not be reset due to key-stream issue.  We wonder how the PDCP operation is not affected by SCG deactivation. The intention of this proposal is to clarify UE behavior, not to suspend PDCP entity. Whether to suspend PDCP entity or keep the PDCP entity alive would be the next step. |
| Apple | See comments | If RAN2 ever agrees the suspension on SCG DRB, we suppose this proposal is true. |
| Futurewei | To discuss | RAN2 could further discuss whether the UE stop the data reception upon the deactivation, or allow some time for some retransmission to complete. Normally, deactivation occurs when not data TRX with SCG. The issue is a corner case. |
| Huawei, HiSilicon | Disagree | Agree with Ericsson that it seems to be a corner case |
| Qualcomm | Agree | If Proposal 4 holds, this proposal also holds and seems to be redundant. |
| Lenovo, Motorola Mobility | Disagree | As commented before, we don’t think it’s necessary to suspend the DRB upon SCG deactivation. Besides, if there is data in the buffer when UE receives a SCG deactivation command, it might lead to UE triggered SCG activation immediately, e.g. sending a SR via SCG if TAT is still running. |
| Spreadtrum | To discuss | To discuss whether SN PDCP is suspended when SCG is deactivated. |
| China Telecom | Agree | If the SCG DRBs should be suspended upon SCG deactivation, the proposal should be supported. |
| vivo | Disagree | Agree with Ericsson. |
| Sharp | To Discuss | Firstly, a need of SCG RB suspension should be discussed(see P1). This proposal is reasonable if SCG DRB is suspended upon SCG deactivation. |
| DOCOMO | Disagree |  |
| DENSO | - | Agree with Nokia. |
| Intel | To discuss | It is related to suspend and SCG activation trigger. |
| CATT | disagree | First we want to clarify what “normal SCG DRB” refers to. Does that only means the SN terminated SCG RLC bearer? How about the MN terminated SCG RLC bearer/SN terminated MCG RLC bearer?  For the PDCP associated with MCG RLC bearer, no matter it is terminated in SN or MN, it should be in active state as legacy.  This question should only foucs on the PDCP only associated with SCG RLC bearer. We think the smart network will de-activate the SCG only when there is no ongoing data transmission on SCG side, so no PDCP PDU needed to be (re)transmited that is no PDU need to be discarded.  From our understanding, the PDCP shouldn’t be impacted by the SCG state(deactivation/activation) except the primary path/duplication configuration for split bearer |
| ZTE | Disagree | Agree with Ericsson. |

Summary: 3 companies agreed to this proposal, 8 companies disagreed to it, and 9 companies thought further discussion is needed.

When UE receives SCG deactivation indication, the receiving PDCP entity may have stored PDCP SDUs (i.e. out-of-order PDCP SDUs) and t-Reordering may be still running. In this case, it should wait for the expiry of t-Reordering to deliver them to upper layer, which can cause unnecessary delay. To resolve this, we can stop t-Reordering and deliver the stored PDCP SDUs to upper layer, if any.

In the early stage of NR, RAN2 had similar discussion for the case that UE goes to RRC INACTIVE state and finally specified the corresponding behavior in 38.323 as follows:

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| --- |
| 5.1.4 PDCP entity suspend  …  When upper layers request a PDCP entity suspend, the receiving PDCP entity shall:  - if t-*Reordering* is running:  - stop and reset *t-Reordering*;  - deliver all stored PDCP SDUs to the upper layers in ascending order of associated COUNT values after performing header decompression;  - set RX\_NEXT and RX\_DELIV to the initial value. |

**Proposal 9. The receiving PDCP entity of the normal SCG DRB stops t-Reordering if running and deliver the stored PDCP SDUs to upper layer upon SCG deactivation.**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comments |
| LG | Disagree | We think PDCP operation should not be affected by SCG deactivation. There is no harm to keep the PDCP entity alive. |
| MediaTek | To Discuss | It seems that a little bit strange to put SCG to deactivated state while there data ongoing on SCG DRB. But if yes, we think this is correct behavior. |
| Ericsson | Disagree | See above for proposal 8. |
| OPPO | To Discuss | For SCG deactivation case, only SCG RLC bearer is suspended and the PDCP will not be suspended. E,g, for SN terminated MCG bearer, the PDCP in SCG side cannot be suspended. We can use the uniform rules for all PDCP in SN side. |
| Nokia | - | Let’s first discuss whether we even suspend |
| Samsung | Agree | We have the same issue when the network sends UE to RRC INACTIVE state. Even if there is no on-going data on SCG DRB, the receiving PDCP entity can keep t-Reordering running after final reception. For example, this can happen for UM DRB.  We wonder how the PDCP operation is not affected by SCG deactivation. The intention of this proposal is to clarify UE behavior, not to suspend PDCP entity. Whether to suspend PDCP entity or keep the PDCP entity alive would be the next step. |
| Apple | See comments | If RAN2 ever agrees the suspension on SCG DRB, we suppose this proposal is true. |
| Futurewei | To discuss | To discussion whether we should maintain the data TRX until t-Reordering is expired. It is a corner case. |
| Huawei, HiSilicon | Disagree | We think PDCP needs not be suspended |
| Qualcomm | Agree | Same comment as in Proposal 8. |
| Lenovo, Motorola Mobility | Disagree | Depends on the discussion about DRB suspension upon SCG deactivation, there seems no need. |
| Spreadtrum | To discuss | To discuss whether SN PDCP is suspended when SCG is deactivated. |
| China Telecom | Agree | If the DRBs are suspended, this proposal should be supported. |
| vivo | Disagree | No need to suspend PDCP. |
| Sharp | To Discuss | Firstly, a need of SCG RB suspension should be discussed(see P1). This proposal is reasonable if SCG DRB is suspended upon SCG deactivation. |
| DOCOMO | Disagree | But depends on the discussion about DRB suspension upon SCG deactivation |
| DENSO | - | Agree with Nokia |
| Intel | To discuss | It is related to suspend issue. |
| CATT | disagree | See comment for proposal 8 |
| ZTE | To discuss | Need to discuss whether PDCP is suspended when SCG is deactivated. |

Summary: 3 companies agreed to this proposal, 7 companies disagreed to it, and 10 companies thought further discussion is needed. . Proposal 8 and 9 are related to Proposal 3. So, the rapporteur suggests the following proposals:

**If suspension of SN terminated bearer is agreed in Proposal 3, then RAN2 discuss the following proposals:**

**Proposal 8. Discuss if the transmitting PDCP entity of SN terminated bearer discards PDCP PDUs upon SCG deactivation.**

**Proposal 9. Discuss if the receiving PDCP entity of SN terminated bearer stops t-Reordering if running and delivers the stored PDCP SDUs to upper layer upon SCG deactivation.**

# Conclusion

**The rapporteur suggests to discuss the following proposals:**

**Proposal 1. Suspend SRB3 upon SCG deactivation, if configured.**

**Proposal 2. Discuss if the old RRC message for SRB3 is discarded after SCG has been deactivated, if any.**

**Proposal 3. Discuss how to handle SN terminated bearer upon SCG deactivation:**

* **Option 1: Suspend SN terminated bearer upon SCG deactivation, if configured.**
* **Option 2: Network ensures that SN terminated bearer is not configured before/upon SCG deactivation.**
* **Option 3: SN terminated bearer is kept alive upon SCG deactivation, i.e. do nothing.**

**Proposal 4-1. Discuss how to handle SCG RLC bearer of MN terminated bearer upon SCG deactivation:**

* **Option 1: Suspend SCG RLC bearer of MN terminated bearer upon SCG deactivation, if configured.**
* **Option 2: Network ensures that SCG RLC bearer of MN terminated bearer is not used before/upon SCG deactivation, e.g. reconfiguration to another bearer or release or *ul-DataSplitThreshold* with infinity value and primary path to MCG.**
* **Option 3: SCG RLC bearer of MN terminated bearer is kept alive upon SCG deactivation, i.e. do nothing.**

**Proposal 4-2. Discuss how to handle SCG RLC bearer(s) of duplication bearer upon SCG deactivation:**

* **Option 1: Suspend SCG RLC bearer(s) of duplication bearer upon SCG deactivation, if configured.**
* **Option 2: Network ensures that SCG RLC bearer(s) of duplication bearer is not used before/upon SCG deactivation, e.g. deactivation of PDCP duplication.**
* **Option 3: SCG RLC bearer(s) of duplication bearer is kept alive upon SCG deactivation, i.e. do nothing.**

**Proposal 5. The security key update is up to network implementation upon SCG activation from deactivation.**

**If suspension of SN terminated bearer is agreed in Proposal 3, then RAN2 discuss the following proposals:**

**Proposal 6. Resume SN terminated bearer after RLC/PDCP re-establishment (e.g. based on *reestablishRLC* and *reestablishPDCP* indicators) upon SCG activation, if security key is updated.**

**Proposal 7. Resume SN terminated bearer without RLC/PDCP re-establishment (e.g. based on *reestablishRLC* and *reestablishPDCP* indicators) upon SCG activation, if security key is not updated.**

**Proposal 8. Discuss if the transmitting PDCP entity of SN terminated bearer discards PDCP PDUs upon SCG deactivation.**

**Proposal 9. Discuss if the receiving PDCP entity of SN terminated bearer stops t-Reordering if running and delivers the stored PDCP SDUs to upper layer upon SCG deactivation.**