**3GPP TSG-RAN WG2#118-e Draft R2-2206166**

**Online, 9 - 20 May 2022**

**Source:** Fujitsu

**Title:** [AT118-e] [223] [DCCA] BFD corrections for DCCA enhancements (Fujitsu)

**Agenda Item:** 6.2.2

**Document for:** Discussion and decision

# 1 Introduction

This document is a summary of:

* [AT118-e][223][DCCA] BFD corrections for DCCA enhancements (Fujitsu)

      Scope: Discuss BFD corrections for R17 DCCA marked for this discussion.

Intended outcome: Discussion report in [R2-2206166](file:///C:\Users\terhentt\Documents\Tdocs\RAN2\RAN2_118-e\R2-2206166.zip).

Deadline: Deadline 3

Company contact persons for this discussion are invited to fill one entry in the table below:

|  |  |
| --- | --- |
| Company | Contact details |
| Huawei, HiSilicon | David Lecompte (david.lecompte at huawei.com) |
| Apple | Naveen Palle(naveen.palle@apple.com) |
| Sharp | Takuma Kawano(kawano.takuma@sharp.co.jp) |
| Lenovo | Congchi Zhang (zhangcc16@lenovo.com) |
| vivo | Xiaodong Yang(yangxiaodong5g@vivo.com) |
|  |  |
|  |  |
|  |  |

# 2 Discussion

## 2.1 Per TRP BFD at SCG deactivation

Support of beam failure detection on each BFD-RS set of deactivated PSCell

At previous RAN2 meetings, some agreements are reached on beam failure detection for the PSCell when SCG is deactivated. [1] raised an issue, i.e. whether these agreements can apply only to BFD at cell level, or also to BFD at TRP level. BFD at TRP level means that beam failure detection on each BFD-RS set of the serving cell. So, regarding this, the possible options are:

* Option 1: beam failure detection on each BFD-RS set of PSCell configured with two BFD-RS sets will not be performed while the SCG is deactivated
* Option 2: beam failure detection on each BFD-RS set of PSCell configured with two BFD-RS sets can be performed while the SCG is deactivated
* Option 3: SCG can only be deactivated with bfd-and-RLM configured to true if the PSCell is configured with a single BFD-RS set
* Option 4: beam failure detection on non-serving BFD-RS set of PSCell configured with two BFD-RS sets is not done while the SCG is deactivated

**Q1-1: Which option(s) do companies prefer?**

|  |  |  |
| --- | --- | --- |
| Company | Preference(s) | Comments |
| Huawei, HiSilicon | Option 2 or 3 | The UE behaviour for BFD on the PSCell should be the same regardless whether the SCG is activated or not, so option 1 should be excluded |
| Apple | Op3, but Op2, Op4 might be possible | We need to evaluate the operation of SCG deactivation with mTRP configured. Atleast the inter-node communication of mTRP now needs to include the SCG status info for PSCell. In our view we need to evaluate this, in FeMIMO session, it is agreed that RAN2 will view this in case of issues. Probably simpler option is to go with option 3, and leave it to NW to not configure. |
| Sharp | Option 3 | We think no special handling is needed. Option 2 is possible but we prefer simple UE operaation in Rel-17. |
| Lenovo | Option 2 | We dont foresee much problem to support BFD on each BFD-RS when SCG is deactivated. |
| vivo | OP3 is OK for not coupling SCG deactivation with MTRP.  OP2 is OK if we support to couple SCG deactivation with MTRP. | Cell BFD RS can not be configured with MTRP BFD RS togeter.  We are ok for not coupling SCG deactivation with MTRP. |

Required changes to MAC spec for Option 1

At RAN2#116bis-e meeting, the following agreements were reached:

|  |
| --- |
| 2-2. If BFD is not configured for deactivated SCG, UE stops (if running) beamFailureDetectionTimer associated with PSCell upon SCG deactivation as a part of partial MAC reset.  4. UE resets BFI\_COUNTER associated with PSCell if BFD is not configured for deactivated SCG, upon SCG deactivation as a part of partial MAC reset. |

According to these agreements, as captured in TS 38.321, the MAC entity stops (if running) all timers, except *beamFailureDetectionTimer* associated with PSCell and *timeAlignmentTimers* if beam failure detection is configured for the deactivated SCG; also, the MAC entity resets *BFI\_COUNTER* associated with PSCell if BFD is not configured for SCG with *bfd-and-RLM*.

In [2], it is proposed to exclude the *beamFailureDetectionTimer* for each BFD-RS set of the PSCell and *BFI\_COUNTER* for each BFD-RS set of the PSCell, i.e. these timers will be stopped, and these counters will be reset, if RAN2 agreed that beam failure detection is not performed for each BFD-RS set of PSCell when the SCG is deactivated, i.e. Option 1 for Q1-1. The proposed changes are shown below:

|  |
| --- |
| The MAC entity shall:  1> stop (if running) all timers, except beamFailureDetectionTimer of PSCell and *timeAlignmentTimers* if beam failure detection is configured for the deactivated SCG;  1> set the NDIs for all uplink HARQ processes to the value 0;  1> set the NDIs for all HARQ process IDs to the value 0 for monitoring PDCCH in Sidelink resource allocation mode 1;  1> stop, if any, ongoing Random Access procedure;  1> flush Msg3 buffer;  1> flush MSGA buffer;  1> cancel, if any, triggered Scheduling Request procedure;  1> cancel, if any, triggered Buffer Status Reporting procedure;  1> cancel, if any, triggered Power Headroom Reporting procedure;  1> cancel, if any, triggered consistent LBT failure;  1> cancel, if any, triggered BFR;  1> cancel, if any, triggered Recommended bit rate query procedure;  1> cancel, if any, triggered Configured uplink grant confirmation;  1> flush the soft buffers for all DL HARQ processes;  1> for each DL HARQ process, consider the next received transmission for a TB as the very first transmission;  1> release, if any, Temporary C-RNTI;  1> reset BFI\_COUNTER of each BFD-RS set for PSCell;  1> reset BFI\_COUNTER of PSCell if BFD is not configured for SCG with *bfd-and-RLM*;  1> reset all *LBT\_COUNTERs*;  1> discard explicitly signalled contention-free Random Access Resources for 4-step RA type and 2-step RA type, if any.  Editor note: FFS if add new clause as MAC reset for SCG deactivation or change the existing MAC reset clause for SCG deactivation |

**Q1-2: Assuming that Option 1 for Q1-1 is agreed, would companies also agree to the proposed changes in 5.12a of TS 38.321 in [2]?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Huawei, HiSilicon | Disagree with 1 (see above) | The intention of the changes is unclear. |
| vivo | No | No change is needed even we couple MTRP with SCG deactivation. |

Required changes to RRC spec for Option 1 [RIL F001]

As captured in 5.3.5.18 of TS 38.331, upon initiating the SCG deactivation procedure, if *bfd-and-RLM* is not configured to true, the UE indicates to lower layers to stop beam failure detection on the PSCell. [1] proposed that the RRC indicates the lower layers to stop the beam failure detection on each BFD-RS set of the PSCell upon SCG deactivation, if Option 1 for Q1-1 is agreed, as shown below.

|  |
| --- |
| 5.3.5.18 SCG deactivation  Upon initiating the procedure, the UE shall:  1> consider the SCG to be deactivated;  1> reset SCG MAC;  1> indicate to lower layers that the SCG is deactivated;  1> indicate to lower layers to stop beam failure detection for each BFD-RS set of the PSCell;  Editor's note: FFS whether to make the above statement conditional to the SCG being previously activated.  1> If *bfd-and-RLM* is not configured to true:  2> stop radio link monitoring on the SCG;  2> indicate to lower layers to stop beam failure detection on the PSCell;  2> stop timer T310 for this cell group, if running;  2> stop timer T312 for this cell group, if running;  2> reset the counters N310 and N311;  1> if the UE was in RRC\_CONNECTED and the SCG was activated before receiving the message for which this procedure is initiated:  2> if SRB3 was configured before the reception of the *RRCReconfiguration* or of the *RRCConnectionReconfiguration* and SRB3 is not to be released according to any *RadioBearerConfig* included in the *RRCReconfiguration* or in the *RRCConnectionReconfiguration* as specified in TS 36.331[10]:  3> trigger the PDCP entity of SRB3 to perform SDU discard as specified in TS 38.323 [5];  3> re-establish the RLC entity of SRB3 as specified in TS 38.322 [4]. |

**Q1-3: Assuming that Option 1 for Q1-1 is agreed, would companies also agree to the proposed change to 5.3.5.18 of TS 38.331 in [1]?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Huawei, HiSilicon | No | We see no relation between option 1 and this proposal, this should be a separate discussion. |
| vivo | No | Agree with huawei |

Further considerations for Option 2

If Option 2 is agreed, i.e. beam failure detection for each BFD-RS set of PSCell configured with two BFD-RS sets can be performed while the SCG is deactivated, the UE behaviour when beam failure is detected at one or both BFD-RS set of the PSCell while the SCG is deactivated should be specified.

In our understanding, in case that beam failure is detected on only one BFD-RS set of the PSCell while the SCG is deactivated, the UE shall stop the beam failure detection on the BFD-RS set and the UE can perform SCG activation without RA procedure. When beam failure is detected on both BFD-RS sets of the PSCell while the SCG is deactivated, the MAC entity will indicate the beam failure to RRC layer so that a Random access procedure is initiated upon SCG activation.

**Q1-4: Assuming that Option 2 for Q1-1 is agreed, would companies also agree to the following UE behaviors:**

1. **the UE shall stop the beam failure detection on the BFD-RS set and the UE can perform SCG activation without RA procedure when beam failure is detected on only one BFD-RS set of the PSCell while the SCG is deactivated**
2. **the MAC entity will indicate the beam failure to RRC layer so that a Random access procedure is initiated upon SCG activation when beam failure is detected on both BFD-RS sets of the PSCell while the SCG is deactivated**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Huawei, HiSilicon | No | We see no relation with option 2 and these two proposals. |
| Lenovo | Partially yes | We suppose what rapporteur means is RACH-less is allowed if BFD detected in only one BFD-RS while the other one still works.  1) and 2) are a bit conflicting? If UE stop BFD after detecting beam failure on one BFD-RS as in 1) how can UE further detemine the BFD on second BFD-RS as indicated in 2)? |
| vivo | No | Agree with huawei |

Also, if Option 2 is agreed, RAN2 needs to discuss whether TRP specific BFD is configured by the same parameter, i.e. *bfd-and-RLM* or another parameter is introduced to configure TRP specific BFD.

**Q1-5: Assuming that Option 2 for Q1-1 is agreed, would companies also agree that TRP specific BFD is configured by the same parameter, i.e. *bfd-and-RLM*? Please provide the details if company prefers a new parameter to configure whether TRP specific BFD is performed while SCG is deactivated.**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Huawei, HiSililcon | Not sure what the question means. | We suggest that UE behaviour for BFD is the same regardless whether the SCG is activated or not. |
| Lenovo | Yes | We assume the question means if bfd-and-RLM is true, and two sets of BFD-RS are configured, that automatically means UE shall perform BFD on each of the BFD-RS |

## 2.2 BFD stop/resumption

About the agreements reached at RAN2#117-e meeting:

Agreement

* 2: Agree UE behaviours for PSCell beam failure while the SCG is deactivated:

a) at PSCell beam failure, TA timer is not stopped

b) at PSCell beam failure, stop BFD

c) resume BFD upon reconfiguration of BFD RS (RadioLinkMonitoringConfig or tci-Info)

Regarding step b) and c), [5] and [7] think that these agreements are not captured by current specifications and RAN2 should capture these agreements in TS 38.331.

**Q2-1: Would companies like to capture above step b) and c) in TS 38.331?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Huawei, HiSilicon | No | b): if there was Beam Failure, BFI\_COUNTER >= beamFailureInstanceMaxCount and according to 38.321 the UE does nothing. Then there is no need to send an indication.  c) is already covered by existing procedure text in 38.321:  2> if *beamFailureDetectionTimer*, *beamFailureInstanceMaxCount*, or any of the reference signals used for beam failure detection is reconfigured by upper layers associated with this BFD-RS set of the Serving Cell:  3> set *BFI\_COUNTER* of the BFD-RS set to 0.  So this will resume UE actions and we don't see the need to specify anything in 38.331 for this. |
| Sharp | Yes  (proponent) | In case that bfd-and-RLM is configured to false, RRC indicates to stop BFD to lower layer.  Therefore, to allign with this, in case that bfd-and-RLM is configured to true and beam failure is declared, RRC should indicate lower layer to stop BFD. In addition, we think RAN2 should specify MAC behaviour based on the BFD stop indication from upper layer. |
| Lenovo | No strong view | As Huawei commented, it is more or less reflected in MAC spec. We can modiy the wording in MAC to make it clear though, if needed. |
| vivo | NO | Agree with huawei |

Regarding BFD stop, i.e. abovementioned step b), both [5] and [7] propose to capture in 5.7.3.2 of TS 38.331 (i.e., initiation of SCG failure information) that the RRC indicates to lower layers to stop BFD if the SCG failure information procedure is initiated due to beam failure on the PSCell while the SCG is deactivated.

**Q2-2: Would companies like to capture above step b) in 5.7.3.2 of TS 38.331 that the RRC indicates to lower layers to stop BFD if the SCG failure information procedure is initiated due to beam failure on the PSCell while the SCG is deactivated?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Huawei, HiSilicon | No | See comments above. |
| Sharp | Yes  (proponent) | See comments above. |
| vivo | NO |  |

Regarding BFD resumption, i.e. abovementioned step c), [5] proposed to capture in 5.3.5.5.7 of TS 38.331 (i.e., SpCell Configuration) that the UE indicates to lower layers to resume beam failure detection on the PSCell if stopped when any of the reference signal(s) that are used for beam failure detection are reconfigured by the received *spCellConfigDedicated* and the SCG is deactivated, and to capture in 5.17 of TS 38.321 that BFD resumption should include the process of BFI\_COUNTER resetting and BFD restarting.

The proposed changes to 5.3.5.5.7 of TS 38.331 in [5] are shown as below:

|  |
| --- |
| 5.3.5.5.7 SpCell Configuration The UE shall:  1> if the UE is connected with a L2 U2N Relay UE via the PC5-RRC connection (i.e. the UE is a L2 U2N Remote UE):  2> use values for timers T300, T301 and T319 as included in *ue-TimersAndConstants-RemoteUE* received in *SIB1*;  2> use value for timers T311, as included in *ue-TimersAndConstants* received in *SIB1*;  1> else  2> if the *SpCellConfig* contains the *rlf-TimersAndConstants*:  3> configure the RLF timers and constants for this cell group as specified in 5.3.5.5.6;  2> else if *rlf-TimersAndConstants* is not configured for this cell group:  3> if any DAPS bearer is configured:  4> use values for timers T301, T310, T311 and constants N310, N311 for the target cell group, as included in *ue-TimersAndConstants* received in *SIB1*;  3> else  4> use values for timers T301, T310, T311 and constants N310, N311, as included in *ue-TimersAndConstants* received in *SIB1*;  2> if the *SpCellConfig* contains *spCellConfigDedicated*:  3> configure the SpCell in accordance with the *spCellConfigDedicated*;  3> consider the bandwidth part indicated in *firstActiveUplinkBWP-Id* if configured to be the active uplink bandwidth part;  3> consider the bandwidth part indicated in *firstActiveDownlinkBWP-Id* if configured to be the active downlink bandwidth part or the bandwidth part for Radio Link Monitoring, Beam Failure Detection and measurements if the *SpCellConfig* is included in an *RRCReconfiguration* message contained in an NR or E-UTRA RRC message indicating that the SCG is deactivated;  3> if any of the reference signal(s) that are used for radio link monitoring are reconfigured by the received *spCellConfigDedicated*:  4> stop timer T310 for the corresponding SpCell, if running;  4> stop timer T312 for the corresponding SpCell, if running;  4> reset the counters N310 and N311.  3> if any of the reference signal(s) that are used for beam failure detection are reconfigured by the received *spCellConfigDedicated*,and if the SCG is deactivated:  4> indicate to lower layers to resume beam failure detection on the PSCell if stopped;  1> if the *SpCellConfig* contains the *lowMobilityEvaluationConnected*:  2> the UE may perform the evaluation of the low mobility criterion for this cell group as specified in 5.7.13.1;  1> if the *SpCellConfig* contains the *goodServingCellEvaluationRLM*:  2> the UE may perform the evaluation of the good serving cell quality criterion for this cell group as specified in 5.7.13.2;  1> if the *SpCellConfig* contains the *goodServingCellEvaluationBFD*:  2> the UE may perform the evaluation of the good serving cell quality criterion for this serving cell as specified in 5.7.13.2; |

While [7] proposed to capture in 5.3.5.5.7 of TS 38.331 (i.e., SpCell Configuration) that the UE restarts BFD (if configured) if the network reconfigures the reference signals used for beam failure detection on the PSCell after SCG beam failure was detected, as shown below.

|  |
| --- |
| 5.3.5.5.7 SpCell Configuration  The UE shall:  1> if the UE is connected with a L2 U2N Relay UE via the PC5-RRC connection (i.e. the UE is a L2 U2N Remote UE):  2> use values for timers T300, T301 and T319 as included in *ue-TimersAndConstants-RemoteUE* received in *SIB1*;  2> use value for timers T311, as included in *ue-TimersAndConstants* received in *SIB1*;  1> else  2> if the *SpCellConfig* contains the *rlf-TimersAndConstants*:  3> configure the RLF timers and constants for this cell group as specified in 5.3.5.5.6;  2> else if *rlf-TimersAndConstants* is not configured for this cell group:  3> if any DAPS bearer is configured:  4> use values for timers T301, T310, T311 and constants N310, N311 for the target cell group, as included in *ue-TimersAndConstants* received in *SIB1*;  3> else  4> use values for timers T301, T310, T311 and constants N310, N311, as included in *ue-TimersAndConstants* received in *SIB1*;  2> if the *SpCellConfig* contains *spCellConfigDedicated*:  3> configure the SpCell in accordance with the *spCellConfigDedicated*;  3> consider the bandwidth part indicated in *firstActiveUplinkBWP-Id* if configured to be the active uplink bandwidth part;  3> consider the bandwidth part indicated in *firstActiveDownlinkBWP-Id* if configured to be the active downlink bandwidth part or the bandwidth part for Radio Link Monitoring, Beam Failure Detection and measurements if the *SpCellConfig* is included in an *RRCReconfiguration* message contained in an NR or E-UTRA RRC message indicating that the SCG is deactivated;  3> if any of the reference signal(s) that are used for radio link monitoring are reconfigured by the received *spCellConfigDedicated*:  4> stop timer T310 for the corresponding SpCell, if running;  4> stop timer T312 for the corresponding SpCell, if running;  4> reset the counters N310 and N311.  1> if the *SpCellConfig* contains the *lowMobilityEvaluationConnected*:  2> the UE may perform the evaluation of the low mobility criterion for this cell group as specified in 5.7.13.1;  1> if the *SpCellConfig* contains the *goodServingCellEvaluationRLM*:  2> the UE may perform the evaluation of the good serving cell quality criterion for this cell group as specified in 5.7.13.2;  1> if the *SpCellConfig* contains the *goodServingCellEvaluationBFD*:  2> the UE may perform the evaluation of the good serving cell quality criterion for this serving cell as specified in 5.7.13.2;  1> if the SCG is deactivated and the beam failure detection was previously stopped due to SCG RLF:  2> if the *SpCellConfig* for the *secondaryCellGroup* contains *spCellConfigDedicated* including a *radioLinkMonitoringConfig* or *tci-Info:*  3> if the *bfd-and-RLM* in *deactivatedSCG-Config* is configured to TRUE:  4> indicate to lower layers that radio link monitoring and beam failure detection is restarted on the PSCell; |

So, regarding step c), the following conditions can be considered when the UE determines whether to resume/restart BFD:

1. the SCG is deactivated (as in [5] [7])
2. the RS for BFD is reconfigured by the received *spCellConfigDedicated* (as in [5])
3. the SpCellConfig for the secondaryCellGroup contains spCellConfigDedicated including a radioLinkMonitoringConfig or tci-Info (as in [7])
4. *bfd-and-RLM* in *deactivatedSCG-Config* is configured to TRUE (as in [7])
5. the BFD was previously stopped due to SCG RLF (as in [7])

**Q2-3: Which conditions should be considered for BFD resumption?**

|  |  |  |
| --- | --- | --- |
| Company | Condition(s) | Comments |
| Huawei, HiSilicon | None | a) was discussed above already.  b) and c) are already covered by existing procedure text in 38.321:  2> if *beamFailureDetectionTimer*, *beamFailureInstanceMaxCount*, or any of the reference signals used for beam failure detection is reconfigured by upper layers associated with this BFD-RS set of the Serving Cell:  3> set *BFI\_COUNTER* of the BFD-RS set to 0.  e) is not very useful because TA timer was stopped  For d), we think the field description of d) is sufficient.  However, we could capture in 38.321 to say what it means that "the UE does not perform BFD". |
| Sharp | a/b/d | 3> if any of the reference signal(s) that are used for beam failure detection are reconfigured by the received *spCellConfigDedicated*,and if *bfd-and-RLM* is configured to TRUE, and if the SCG is deactivated:  4> indicate to lower layers to resume beam failure detection on the PSCell if stopped;  In our contribution [5], Condition d is lacked. So we added above condition . |
| vivo | NO | Agree with huawei |

Regarding BFD resumption, i.e. abovementioned step c), [5] also proposed to capture in 5.17 of TS 38.321 (i.e., Beam Failure Detection and Recovery procedure) the following text.

|  |
| --- |
| The following UE variables are used for the beam failure detection procedure:  - *BFI\_COUNTER* (per Serving Cell or per BFD-RS set of Serving Cell configured with two BFD-RS sets): counter for beam failure instance indication which is initially set to 0.  - set *BFI\_COUNTER* to 0 upon resumption of this procedure by BFD RS reconfiguration. |

**Q2-4: Would companies like to capture in** **5.17 of TS 38.321 that BFD resumption should include the process of BFI\_COUNTER resetting as in [5], in addition to BFD resumption indication in TS 38.331?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Huawei, HiSilicon | No | As mentioned before, this is already covered in 38.321.  If anything would be added, it would be to clarify what the UE does when bfd-and-RLM is not configured to true. |
| Sharp | Yes  (proponent) | As mentioned above our comments, MAC stops BFD procedure based on the upper layer indication. In the case, BFI\_COUNTER is not set to 0 even if RS is changed. We think resetting is needed. |

## 2.3 Initiation of RA procedure due to beam failure

### 2.3.1 when SCG is deactivated

According to current MAC specification,

|  |
| --- |
| The MAC entity shall for each Serving Cell configured for beam failure detection:  1> if beam failure instance indication has been received from lower layers:  2> start or restart the *beamFailureDetectionTimer*;  2> increment *BFI\_COUNTER* by 1;  2> if *BFI\_COUNTER* >= *beamFailureInstanceMaxCount*:  3> if the Serving Cell is SCell:  4> trigger a BFR for this Serving Cell;  3> else if the Serving Cell is PSCell, the SCG is deactivated and beam failure of the PSCell was not indicated to upper layers since the SCG was deactivated:  4> indicate beam failure of the PSCell to upper layers;  3> else  4> initiate a Random Access procedure (see clause 5.1) on the SpCell. |

[3] points out that a Random Access procedure will be initiated on the deactivated PSCell if beam failure on the PSCell is detected after the previous beam failure on this PSCell was indicated to upper layers (i.e. BFD has been resumed due to BFD RS reconfiguration), which contradicts the behaviours of deactivated SCG in Activation/Deactivation of SCG section. So, it is proposed to modify the BFD indication in the current MAC CR in order not to initiate Random Access on PSCell in deactivated SCG.

**Q3-1: Do companies agree that the problem raised in [3] should be fixed?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
| Sharp | Yes  (Proponent) |  |
| Lenovo | Yes |  |
| vivo | YES |  |

[4] provides the suggested changes to fix the problem, as below:

|  |
| --- |
| The MAC entity shall for each Serving Cell configured for beam failure detection:  1>...  1> else:  2> if beam failure instance indication has been received from lower layers:  3> start or restart the *beamFailureDetectionTimer*;  3> increment *BFI\_COUNTER* by 1;  3> if *BFI\_COUNTER* >= *beamFailureInstanceMaxCount*:  4> if the Serving Cell is SCell:  5> trigger a BFR for this Serving Cell;  4> else if the Serving Cell is PSCell and the SCG is deactivated;  5> if beam failure of the PSCell has not been indicated to upper layers since the last time *BFI\_COUNTER* >= *beamFailureInstanceMaxCount* was fullfiled;  6> indicate beam failure of the PSCell to upper layers.  4> else  5> initiate a Random Access procedure (see clause 5.1) on the SpCell.  … |

**Q3-2: Do companies think that the CR in [4] is agreeable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Huawei, HiSilicon | Yes |  |
| Apple | Ok |  |
| Sharp | Yes  (proponent) |  |
| Lenovo | Yes |  |
| vivo | YES |  |

### 2.3.2 upon SCG activation

According to current RRC/MAC specification, [8] understands that the UE will activate SCG with a Random Access procedure in case that BFD RS is changed at the time reception of SCG activation command.

**Q3-3: Do companies agree to the above understanding that the UE will activate SCG with a Random Access procedure in case that BFD RS is changed at the time reception of SCG activation command according to current RRC/MAC specification?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
| Sharp | Yes |  |
| Lenovo | Maybe no | Not sure why NW will reconfigure a new beam if no BFD on the old beam.  If BFD has been detected, then UE will perform RACH upon SCG activation. |
| vivo | YES |  |

To fix the problem, [9] proposed to take the case where BFD-RS is changed at the time reception of SCG activation command into account when the UE determines whether to initiate a RA procedure upon SCG activation. I.e., if reference signal for beam failure detection of the SpCell of the SCG was not changed since the last time that beam failure was indicated from lower layer after deactivating the SCG, the UE initiates the Random Access procedure on the PSCell.

In addition, in [9] and [10], it is proposed that whether to initiate a RA procedure due to beam failure of the deactivated PSCell upon SCG activation is determined by RRC rather than MAC entity.

The proposed changes to 5.3.5.3 of TS 38.331 (i.e. Reception of an *RRCReconfiguration* by the UE) in [9] are shown below:

|  |
| --- |
| 1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (UE in (NG)EN-DC):  2> if the *RRCReconfiguration* message was received via E-UTRA SRB1 as specified in TS 36.331 [10]; or  2> if the *RRCReconfiguration* message was received via E-UTRA RRC message *RRCConnectionReconfiguration* within *MobilityFromNRCommand* (handover from NR standalone to (NG)EN-DC);  3> if the *RRCReconfiguration* is applied due to a conditional reconfiguration execution for CPC which is configured via *conditionalReconfiguration* contained in *nr-SecondaryCellGroupConfig* specified in TS 36.331 [10]:  4> submit the *RRCReconfigurationComplete* message via the E-UTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10], clause 5.6.2a.  3> else if the *RRCReconfiguration* message was included in E-UTRA *RRCConnectionResume* message:  4> submit the *RRCReconfigurationComplete* message via E-UTRA embedded in E-UTRA RRC message *RRCConnectionResumeComplete* as specified in TS 36.331 [10], clause 5.3.3.4a;  3> else:  4> submit the *RRCReconfigurationComplete* via E-UTRA embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10], clause 5.3.5.3/5.3.5.4/5.4.2.3;  3> if the *scg-State* is not included in the E-UTRA *RRCConnectionReconfiguration* message containing the *RRCReconfiguration* message:  4> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:  5> initiate the Random Access procedure on the SpCell, as specified in TS 38.321 [3];  4> if the SCG was deactivated before the reception of the E-UTRA RRC message containing the *RRCReconfiguration* message:  5> if lower layers consider that a Random Access procedure is needed for SCG activation; or  5> if reference signal for beam failure detection of the SpCell of the SCG was not changed since the last time that beam failure was indicated from lower layer after deactivating the SCG:  6> initiate the Random Access procedure on the SpCell, as specified in TS 38.321 [3];  4> else:  5> the procedure ends;  3> else:  4> the procedure ends;  2> if the *RRCReconfiguration* message was received within *nr-SecondaryCellGroupConfig* in *RRCConnectionReconfiguration* message received via SRB3 within *DLInformationTransferMRDC*:  3> submit the *RRCReconfigurationComplete* via E-UTRA embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10], clause 5.3.5.3/5.3.5.4;  3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:  4> initiate the Random Access procedure on the SpCell, as specified in TS 38.321 [3];  3> else:  4> the procedure ends;  NOTE 1: The order the UE sends the *RRCConnectionReconfigurationComplete* message and performs the Random Access procedure towards the SCG is left to UE implementation.  2> else (*RRCReconfiguration* was received via SRB3) but not within *DLInformationTransferMRDC*:  3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;  NOTE 2: In (NG)EN-DC and NR-DC, in the case *RRCReconfiguration* is received via SRB1 or within *DLInformationTransferMRDC* via SRB3, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case *RRCReconfiguration* is received via SRB3 but not within *DLInformationTransferMRDC*, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.  1> else if the *RRCReconfiguration* message was received via SRB1 within the *nr-SCG* within *mrdc-SecondaryCellGroup* (UE in NR-DC, *mrdc-SecondaryCellGroup* was received in *RRCReconfiguration* or *RRCResume* via SRB1):  2> if the *RRCReconfiguration* is applied due to a conditional reconfiguration execution for CPC which is configured via *conditionalReconfiguration* contained in *nr-SCG* within *mrdc-SecondaryCellGroup*:  3> submit the *RRCReconfigurationComplete* message via the NR MCG embedded in NR RRC message *ULInformationTransferMRDC* as specified in clause 5.7.2a.3.  2> if the *scg-State* is not included in the *RRCReconfiguration* or *RRCResume* message containing the *RRCReconfiguration* message:  3> if *reconfigurationWithSync* was included in *spCellConfig* in nr-SCG:  4> initiate the Random Access procedure on the PSCell, as specified in TS 38.321 [3];  3> if the SCG was deactivated before the reception of the NR RRC message containing the *RRCReconfiguration* message:  4> if lower layers consider that a Random Access procedure is needed for SCG activation; or  4> if reference signal for beam failure detection of the SpCell of the SCG was not changed since the last time that beam failure was indicated from lower layer after deactivating the SCG:  5> initiate the Random Access procedure on the PSCell, as specified in TS 38.321 [3];  3> else:  4> the procedure ends;  2> else  3> the procedure ends;  NOTE 2a: The order in which the UE sends the *RRCReconfigurationComplete* message and performs the Random Access procedure towards the SCG is left to UE implementation. |

The proposed change to 5.29 of TS 38.321 (i.e. Activation/Deactivation of SCG) in [10] is shown below:

|  |
| --- |
| The network may activate and deactivate the configured SCG. The MAC entity shall for the configured SCG:  1> if upper layers indicate that activation of the SCG:  2> if the *timeAlignmentTimer* associated with PTAG is not running:  3> indicate to upper layers that a Random Access Procedure (as specified in clause 5.1.1) is needed for SCG activation;  2> else if a Random Access Procedure is not triggered for SCG activation:  3> activate the SCG according to the timing defined in TS 38.133 [11] for direct SCG activation; |

**Q3-4: Do companies think that the CRs in [9][10] are agreeable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | No | 38.331: there are proposals to notify MAC only after everything was processed in the SCG configuration. In this case, BFI\_COUNTER will be set to 0 by the reception of the RS reconfiguration, so MAC will not trigger RACH and the problem is solved.  38.321: no need for any change. |
| Sharp | Yes  (proponent) | We assume BFD procedure is stopped during SCG deactivated in case that beam failure is declared or BFD is not configured. So we think changes are needed. |
| vivo | NO |  |

## 2.4 BFR information in the SCGFailureInformation

In current TS 38.331, the UE sends *SCGFailureInformation* message to network with the *failureType* is set to be beamFailure when beam failure is detected while SCG is in deactivated state. [6] proposed that the UE provides some assistance information, i.e. the suitable beam index information in *SCGFailureInformation* signalling to the network so that the NW can update the TCI state(s) and thus the UE can perform SCG activation without RA.

**Q4-1: Would companies like to include the suitable beam index information in *SCGFailureInformation* signalling to the network?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | Yes but | the UE already reports beams of the serving cell (and other cells) in the SCG failure information procedure which is reused, so no change is needed. |
| Apple | No, but | As Huawei mentioned, UE already reports. |
| Sharp |  | We also think the information is already included. |
| Lenovo | Yes | Not sure if existing IEs can be reused for the same purpose, e.g., failedPSCellId-r17 + failureType, otherwise it looks reasonable to modify as [6] proposed. |
| vivo | No | Exsting beam index report can be used. |

[6] provided the text proposals for TS 38.331 and for TS 37.340.

For 5.7.3.5 of TS 38.331 (i.e., Actions related to transmission of *SCGFailureInformation* message)

|  |
| --- |
| The UE shall set the contents of the *SCGFailureInformation* message as follows:  …  1> else if the UE initiates transmission of the *SCGFailureInformation* message due to detection of beam failure of the PSCell while the SCG is deactivated:  2> set the *failureType* as *other* and set *failureType-v1610* as *beamFailure*.  2> include *candidateRsIndex* in *SCGFailureInformation* message if available.  … |

For 6.3.2 of TS 38.331 (i.e., Radio resource control information elements)

|  |  |  |  |
| --- | --- | --- | --- |
| *SCGFailureInformation* message  -- ASN1START  -- TAG-SCGFAILUREINFORMATION-START  SCGFailureInformation ::= SEQUENCE {  criticalExtensions CHOICE {  scgFailureInformation SCGFailureInformation-IEs,  criticalExtensionsFuture SEQUENCE {}  }  }  SCGFailureInformation-IEs ::= SEQUENCE {  failureReportSCG FailureReportSCG OPTIONAL,  nonCriticalExtension SCGFailureInformation-v1590-IEs OPTIONAL  }  …  FailureReportSCG ::= SEQUENCE {  [[  previousPSCellId-r17 SEQUENCE {  physCellId-r17 PhysCellId,  carrierFreq-r17 ARFCN-ValueNR  } OPTIONAL,  failedPSCellId-r17 SEQUENCE {  physCellId-r17 PhysCellId,  carrierFreq-r17 ARFCN-ValueNR  } OPTIONAL,  timeSCGFailure-r17 INTEGER (0..1023) OPTIONAL,  perRAInfoList-r17 PerRAInfoList-r16 OPTIONAL,  candidateRsIndex-r17 CHOICE {  ssb-Index-r17 SSB-Index,  csi-RS-Index-r17 NZP-CSI-RS-ResourceId  }  ]]  }  …   | *SCGFailureInformation field descriptions* | | --- | | ***candidateRsIndex***  The field is used to indicate suitable beam index to network when beam failure is detected while in deactivation SCG. The field is set to the index of an SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the SSBs in *candidateBeamRSList* or to the index of a CSI-RS with CSI-RSRP above *rsrp-ThresholdSSB* amongst the CSI-RSs in *candidateBeamRSList*. | | ***…*** | |

For 7.7 of TS 37.340 (i.e., SCG/MCG failure handling)

|  |
| --- |
| RLF is declared separately for the MCG and for the SCG.  …  In case of deactivation SCG, upon transmission of the *SCGFailureInformation* message to the MN when beam failure is detected during SCG deactivation, the suitable beam index could be included in *SCGFailureInformation* message to SN via MN, SN may response the UE by sending the updated activated TCI state via MN to UE to perform BFR without triggering RACH when receiving the suitable beam index information.  … |

**Q4-2: If the answer to Q4-1 is Yes, would companies also agree to the text proposals for TS 38.331 and for TS 37.340 in [6]?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSilicon | No | This is legacy procedure so there is no need to specify anything. |
| Apple | No | Same view as Huawei |
| Sharp | No | Same view as Huawei. |
| Lenovo | Yes | As commented in Q4-1. Actually, wouldn’t it be also benefitial to report other available beams for NW to better reconfigure? |

# 3 Conclusion

# 4 References

1. [R2-2204910](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_118-e\\R2-2204910.zip) [F001] Beam failure detection upon SCG deactivation Fujitsu

1. [R2-2204909](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_118-e\\R2-2204909.zip) Beam failure detection upon SCG deactivation Fujitsu draftCR Rel-17 38.321 17.0.0 F

1. [R2-2205273](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_118-e\\R2-2205273.zip) Remaining issues for BFD indication in deactivated SCG Sharp

1. [R2-2205274](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_118-e\\R2-2205274.zip) CR on 38.321 for Remaining issues for BFD indication in deactivated SCG Sharp CR Rel-17 38.321 17.0.0 1267 - F

1. [R2-2205280](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_118-e\\R2-2205280.zip) [J006] Correction of BFD procedure Sharp

1. [R2-2205422](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_118-e\\R2-2205422.zip) Discussion on Beam Failure Information for Deactivated SCG CATT

1. [R2-2205797](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_118-e\\R2-2205797.zip) [E129] Stop/resume BFD at beam failure for deactivated SCG Ericsson

1. [R2-2205277](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_118-e\\R2-2205277.zip) RACH-less SCG activation by SCG activation command with BFD RS change Sharp

1. [R2-2205278](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_118-e\\R2-2205278.zip) CR on 38.331 for RACH-less SCG activation by SCG activation command with BFD RS change Sharp CR Rel-17 38.331 17.0.0 3062 - F

1. [R2-2205279](file:///C:\\Users\\terhentt\\Documents\\Tdocs\\RAN2\\RAN2_118-e\\R2-2205279.zip) CR on 38.321 for RACH-less SCG activation by SCG activation command with BFD RS change Sharp CR Rel-17 38.321 17.0.0 1269 - F