3GPP TSG-RAN WG2 #115-e draft R2-21xxxxx

Electronic meeting, Aug 16th – 27th 2021

Agenda Item: 8.13.2.3

Source: CATT

Title: [Post114-e][852][SON/MDT] Modelling aspects related to information required by SN/SCG (CATT)

Document for: Discussion

# 1 Introduction

This document captures the outcome of the following email discussion [1]:

* [Post114-e][852][SON/MDT] Modelling aspects related to information required by SN/SCG (CATT)

Scope:

How to transfer RA report to the SN

How to transfer SN related MHI information

How to transfer and what information to transfer in association to the SCG failure

Here also one can use the current Rel-16 version (after Jun Plenary) as baseline to start discussing the ASN.1 changes required for different options.

Intended outcome: Email discussion report

Deadline: Long

This document is organized as the following. The discussions are in section 2, and the summary and proposals are in section 3.

# 2 Discussions

Please the participating delegates provide their contact information in this table.

|  |  |
| --- | --- |
| Company | Contact Name / Email address |
| Huawei | Brian Martin [brian.alexander.martin@huawei.com](mailto:brian.alexander.martin@huawei.com) |
| Samsung | Sb07.kim@samsung.com |
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## 2.1 RA Report to the SN

Some background is provided on previous discussions.

**Background of the topic**

RAN3 has sent LS [2] to RAN2, which indicates that there was no means for the SgNB to retrieve from UE in MR-DC any information on RACH access procedure at SgNB, and thus there was no input for SON algorithm to adjust the RA related parameters in SgNBs. RAN3 asks RAN2 to consider UE RACH report for SgNBs and provide feedback to RAN3.

**Options**

This topic was discussed in the previous RAN2 meetings. More specifically, two options were summarized for SgNB RACH report [3]:

* Option 1: UE reports the SN RACH report to the MN, and then MN sends the SN RACH report to the SN;
* Option 2: SN requests SgNB RACH report, and then UE reports the SN RACH report to the SN, directly via SRB3 or via SRB1;

**Analysis of the options**

In order for RACH configuration optimization, the RACH report may need to be forwarded by either the MN (in Option 1) or by the SN (in Option 2) that gets the report from UE, to the SN for which the RACH procedure actually occurred. One observation was made in [3] to reflect this.

Observation 2.3.1-1 The mechanism that the current MN or SN forward the SN RACH report to the SN for which the RACH procedure actually occurred is anyway needed, no matter whether Option 1 or 2 is used [3].

The specification impact of these options were also discussed [3], where vast majority of the companies agreed with the following analysis

Specification impact of Option 1:

* For NR-DC case, current *rapurpose* already supported SN related RACH report, so there is no specification impact;
* For EN-DC case, the LTE RACH Report may need to include a NR container about SgNB UE RACH Report content.

Specification impact of Option 2:

* Legacy *UEInformationRequest* message can be embedded in EUTRA/NR *DLInformationTransferMRDC* to enable the interaction between SN and UE;
* Enhancements on the support of SgNB RACH report are required, potential solutions include:

a) The UE transfers the SN-related RACH report to SN via *ULInformationTransferMRDC*.

b) A new message, e.g., *UEInformationReponseSCG*, is used to transfer the SN RACH report to SN via SRB1 or SRB3 (if configured).

**Views from previous discussions**

From [3], vast majority (10/12) support Option 1. But there was no agreement, as some concerns exist, i.e.,

1. All nodes (MN and SN) may not support fetching of the MHI, hence option 2 can give the possibility to directly fetch the SN report, in case the PCell does not support MHI fetching [3].
2. Specification impact has not been evaluated so far in the discussions we have had. For option1, one needs to make multiple changes to both NR and LTE RRC specification and include new octet string based report retrieval which is unnecessarily complex [4].

**Further Analysis by Rapporteur**

It does not seem necessary to repeat all the discussions and views in [3][4]. Therefore in the following Rapporteur tries to provide some understanding on those concerns, so the companies can further discuss to see if any progress is possible.

For concern 1:

* In NR, the RACH report introduces the field of RA-ReportList-r16 which could recode RA info of multiple nodes (at least 8 entries), the node receiving RA Report from UE needs to forward the RA info to the right node. Therefore for NR RACH Report, the NG-RAN node which received the MHI from UE should support the MHI fetching function.
* For option 2 where SN directly receives the RA report, it is possible that the SN is a lower version NG-RAN node or it is even a non-standalone node (NSA scenario), and the RA information cannot be transferred from the SN.

For concern 2:

* Option 1 only impacts EN-DC scenario and current 38.331 text and ASN.1 cover the NR-DC scenario, while option 2 impact both EN-DC and NR-DC scenarios.
* For option 2, if SgNB directly retrieves RACH information, the network needs to firstly determine whether the SgNB related RACH information exists, which may also require some work.
* As observed in [3], the mechanism that the current MN or SN forward the SN RACH report to the SN for which the RACH procedure actually occurred is anyway needed, no matter whether Option 1 or 2 is used.

While the intention is not to repeat the old discussions, companies may check the background and analysis above, to see if they have other further comments to these options.

**Q1: Do you agree with Rapporteur’s analysis above on Option 1 and 2? Please share your further comments on option 1 and 2 if any.**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| Huawei, HiSilicon | Yes | We see that Option 1 is more straightforward and simpler than Option 2. |
| Samsung | No | On option 2, it’s not sure why new message UEInformationResponseSCG is required, i.e.  In SRB1, UEInformationRequest and UEInformationResponse would be carried over DLInformationTransferMRDC and ULInformationTransferMRDC.  And, if SRB3 has been configured, UEInformationRequest and UEInformationResponse would be carried over SRB3. |
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Based on the above, Rapporteur thinks it possible to go with the majority’s preference i.e., option 1. This is checked by the following question.

**Q2: Is Option 1 acceptable to you? Please comment if any.**

*Option 1: UE reports the SN RACH report to the MN, and then MN sends the SN RACH report to the SN*

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| **Company** | **Yes/No** | **Comments if any** |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes |  |
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**Summary of SgNB RACH report**

**TBD**

## 2.2 SN Related MHI Information

PSCell MHI enhancement has been discussed [3][4], covering the following

* Issue 1: Structure of PSCell MHI
* Issue 2: Where to report PSCell related MHI
* Issue 3: Main content for PSCell MHI
* Issue 4: Message used to convey PSCell MHI
* Issue 5: Applicable scenarios

Some agreements were reached on the issue 3, i.e., the content.

In the following, we continue the discussions. It is noted that since the scenario (i.e., issue #5) can be discussed separately from the previous technical issues, and there were company proposals to postpone scenario discussions, Rapporteur suggests postpone as well, but focusing on other aspects that may progress.

### 2.2.1 Structure of PSCell MHI

This issue has been discussed in [3]. Some background is provided here to facilitate the discussions.

**Background**

Two options are raised in previous discussions

* Option 1: PSCell MHI nested within the PCell MHI.
* Option 2: PSCell MHI as a separate report from PCell MHI

For option 1, in each entry of PCell, multiple PSCells could be recorded. The correlation of the PCell and each PSCell is clear. From the information, the network can know the addition, release or change of the PSCell.

For option 2, the lists of PCell(s) and PSCell(s) are recorded separately, which may be more flexible. But on the other hand, the network may not know the association between the PScell and PCell based on the report.

From [4], some companies still have concern on Option 1. More specifically they are not convinced what the use case of such correlation is, and concerns the huge memory on UE side; some companies also think that a second list is more logical and can cover more cases.

**RAN3 progress**

In RAN3#112 meeting, work assumptions were made for the structure of CONNECTED mode SN UHI [5]:

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| **WA: SN is responsible for collecting the SN UHI;**  **WA: Correlation of MN UHI and SN UHI could be realized via two-dimensional structure for UHI (PSCells history information are listed within each PCell in the UHI); it may not be feasible on all interfaces.** |

Therefore the MN will maintain both the UHIs of MN and SN, PSCell UHI will be nested within the PCell UHI in MN. The SN is responsible for collecting the SN UHI and then sends the collected result to the MN.

**Further analysis from Rapporteur**

First of all, as shown in [3], Option 1 has support from a great majority.

Then as per RAN3 progress, it seems meaningful to have a clear association of the PCells and the PSCells, and the two-dimensional structure for MHI is reasonable choice.

At last, regarding the previous concerns on Option 1, the correlated information may be used together to deduce the UE path more accurate which could also has benefit for MN. Considering the UE memory, how many PSCells could be correlated to one PCell needs further discussion.

With these, Rapporteur understands that a potential WF is to go with majority’s view, and would like to check with companies on this.

**Q3: Is Option 1 acceptable to you? Please comment if any.**

*Option 1: PSCell MHI nested within the PCell MHI*

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| **Company** | **Yes/No** | **Comments if any** |
| Huawei, HiSilicon | Yes |  |
| Samsung | No with comments | As summarized by Rapporteur, we are concerned with (potential) huge memory on UE side i.e. the worst case will be 16\*16 big list.  Regarding the following WA,  **it may not be feasible on all interfaces**  our understanding is that according to RAN3 specification PCell ID is not always send to SN so SN has no way to link it. Similarly, there seems a case that MN doesn't know PSCell ID. Thus, even if we go for Option 1, the issue may still exist i.e. the network may not know the association between the PScell and PCell based on the report without updating RAN3 specification. It may be good to wait RAN3 progress. |
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**Summary of 2.2.1**

**TBD**

### 2.2.2 Where to Report PSCell Related MHI

**Background**

Two options were listed according to company proposals [3][4]:

* Option 1: PSCell MHI is reported to both PCell and PSCell MHI.
* Option 2: PSCell MHI is reported only to PCell

Based Option 1, the UE is allowed to send *mobilityHistoryAvail* indicator the SN node, and the SN node is also allowed to request for MHI result from UE.

For option 2, the UE reports all the MHI to the MN node. After receiving the MHI, the MN node could make use of the MHI itself to improve its corresponding configuration, and it may also forward the information to the SN.

**Main concern from companies**

In the first round discussion in [3], 10 companies (10/13) support option 2 that PSCell MHI is reported only to PCell, and the left companies (3/13) support option 1. The main motivations for option 2 seem to include:

* PSCell MHI report is not time sensitive, so there is no need to directly report it to PSCell and enhance signaling methods and overhead for that;
* Establishing SRB3 only for transmitting MHI report may not be needed;
* it is possible for MN to forward the SN related information to SN if needed, which can be easily supported with RAN3’s signalling.

But there were also concerns on option 2 [4]:

* Option 2 cannot support the independence of MHI report fetching for SN, and limit the flexibility of choice to NW implementation (i.e., NW can decide whether SN shall directly request the report or not).
* If the PCell does not support PSCell MHI retrieving, then all the SN MHI reports are lost even if the PSCell supports that.
* Specification impact is much larger compared with a solution in which the MHI goes also directly to the SN.

The group were not able to conclude on this due to lack of time in previous meetings.

Now that companies have more time to check the pros and cons, they are invited to share their preference by taking all these previous discussions into account.

**Q4: Which option do you prefer regarding where to report the PSCell related MHI? And please provide your further comment if any.**

*Option 1: PSCell MHI is reported to both PCell and PSCell*

*Option 2: PSCell MHI is reported only to PCell*

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| **Company** | **Preferred option** | **Comments if any** |
| Huawei, HiSilicon | Option 2 |  |
| Samsung | Option 2 |  |
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**Summary of 2.2.2**

**TBD**

### 2.2.3 Message Used to Convey PSCell MHI

Furthermore, which message could carry the PSCell MHI was also discussed [3][4]. It seems clear that this issue may depend on the conclusion of the previous issues.

According to the companies’ feedback, majority support to use *UEInformationResponse* message to convey the PSCell MHI to the MN, but since there are some companies support to also transfer PSCell MHI to the SN directly, DL/ULInformationTrasnferMRDC (e.g. with SRB1 or SRB3) is a simple way.

Besides, some companies pointed out that the wording “enhanced” of the proposal in [4] could be misleading, as it may imply procedure change to UE Information reporting. This in the following some fine tuning of wording is done.

Companies are invited to share their view on whether the *UEInformationResponse* message is used to convey the PSCell MHI to the MN.

**Q5: Whether the *UEInformationResponse* message is used to convey the PSCell MHI to the MN?**

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| **Company** | **Yes/No** | **Comments if any** |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes |  |
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And whether the messages of DL/ULInformationTrasnferMRDC are used to convey the PSCell MHI directly to the SN could also be decided, once there is a conclusion for the issue in section 2.2.2. A conditional question is as the following.

**Q6: If PSCell MHI is reported to both PCell and PSCell MHI, whether the *DL/ULInformationTrasnferMRDC* messages are used to convey the PSCell MHI to the SN?**

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| **Company** | **Yes/No** | **Comments if any** |
| Samsung | Yes |  |
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**Summary of 2.2.3**

**TBD**

### 2.2.4 Main Content for PSCell MHI

In RAN2#113bis meeting only one agreement is achieved for issue 3:

Agreements:

Mobility history information enhancements

1 If PSCell MHI is introduced, at least include PSCell ID (may include CGI or frequency+PCI) and the time UE stayed in each PSCell into PSCell MHI.

Some other content of PSCell MHI was also discussed in company contributions, where the information below is supported at least by 3 companies [6][7][8]:

* The time without PSCell in the PSCell MHI report

Companies are invited to share their view on further information to support, if any.

**Q7: Whether ‘the time without PSCell in the PSCell MHI report’ needs to be support? Or please comment if you see any other necessary content(s).**

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| **Company** | **Yes/No** | **Other comments/preference if any** |
| Huawei, HiSilicon | Yes | In our paper R2-2103733 for RAN2#113b-e, we propose to consider the scenario where the SN is released, because the continuous info for PSCell mobility can help the network to better estimate the UE mobility state. |
| Samsung | No | It is a clean approach to define seperate IE (e.g. visitedCellInfoListSCG). |
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**Summary of 2.2.4**

**TBD**

## 2.3 Report and Content of SCG Failure Information

### 2.3.1 Contents related to SCG failure ~~Content of SCG Failure Information~~

In the previous discussions [4], majority of the companies seem to prefer the RAN3 LS [10] as a baseline for the SCG failure recording for the purpose of PSCell failure analysis. Some information from the LS is copied below.

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| RAN3 discussed the solution for the optimization of PScell change failure for MRO in case of MR-DC. RAN3 agreed it is beneficial for the NG-RAN node to receive the list of information as shown below for the purpose of PSCell failure analysis:   1. CGI of the Source PSCell: the source PSCell of the last SN change. The source PSCell could be E-UTRA cell or NR cell. 2. CGI of the Failed PSCell: the PSCell in which SCG failure is detected or the target PSCell of the failed PScell change. The Failed PSCell could be E-UTRA cell or NR cell. 3. timeSCGFailure: the time elapsed since the last PSCell change initialization until SCG failure. 4. connectionFailureType: radio link failure or SN change failure. 5. random-access related information set by the PSCell |

But no conclusion was made due to lack of time [11].

In the following we first try to confirm the content based on majority’s view from the previous discussions.

**Q8: Whether all content suggested by RAN3 LS R3-211332 should be reported by UE?**

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| **Company** | **Yes/No** | **Comments if any** |
| Huawei, HiSilicon | Only 1, 2 and 3 | As commented in 2.3.4, only NR-DC and NE-DC are considered, so 4) is not required as there is failureType in SCGFailureInformation and SCGFailureInformationEUTRA messages.  For 5), we are open and we think it is related to SN RACH report. At RAN2#113b-e, it is FFS on SgNB RACH report, and RAN2 may discuss it in future meetings. If SgNB RACH report is to include SCG failure scenario, there may be no need to discuss it here.  *SgNB RACH report*  *FFS: Proposal 11: UE reports the SN RACH report to the MN, and then MN sends the SN RACH report to the SN.* |
| Samsung | Yes |  |
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Then there may be proposals for additional contents, and that could be discussed in the following.

**Q9: Which additional content than those mentioned by RAN3 LS R3-211332 are needed? Please comment if any.**

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| **Company** | **Preferred additional content if any** | **Comments if any** |
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**Summary of issue 2.3.1**

**TBD**

### 2.3.2 Which Message(s) to Use

Here, possible alternatives are listed in terms of the message to carry the SCG failure related information to the network [12]:

Option 1: Reuse existing SCG failure messages;

* SCG failure messages have been already specified to carry the information regarding NR/E-UTRA SCG failures. And since it’s one-shot information unlike MDT operation periodically logged, the increased burden would be limited. [13]
* Some information requested by RAN3 LS is already present in the SCG Failure Information; [6] [14]

Option 2: Use other message(s);

* Adding the information requested by RAN3 LS in the SCG failure information messages may significantly increase the size of this report substantially which is not desired, especially because the SCGFailureInformation report should be delivered quickly reliably in order to minimize the service interruptions. Such concern should not be neglected, especially e.g. for URLLC type of scenarios. [7]

Companies are invited to provide their preference on these options.

**Q10: Which option do you prefer to transfer the SCG failure information to the network for PSCell failure analysis? And please provide your further comments if any.**

*Option 1: Reuse existing SCG failure messages*

*Option 2: Use other message(s)*

**And please specify which message(s) is used if you prefer Option 2.**

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| **Company** | **Preferred option** | **Comments if any (e.g., which msg if you prefer O2)** |
| Huawei, HiSilicon | Option 1 | In section 2.3.1, based on our comments, the added information are CGI info of source PSCell and failed PSCell, and timeSCGfailure.  We prefer option 1. The existing SCG failure message is to inform E-UTRAN/NR MN about an SCG failure, so it is straightforward to extend the message for including above new info. In addition, regarding the increased size of the report, we think it exists in both options. |
| Samsung | Option 1 | We would like to minimize spec impact, i.e. it is not reasonable to introduce new RRC message for each specific purpose.  Since MCG link is mostly stable, we have not assumed that there would be remarkable service interruption. |
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**Summary of issue 2.3.2**

**TBD**

### 2.3.3 Further Details on Message Design

Companies may have different views regarding whether current messages already include the requested content, e.g., in [6][14] some detailed analysis was provided regarding which content was already covered, and which content should be added, if existing SCG failure messages is reused.

Again, the following lists are from RAN3 LS:

1. CGI of the Source PSCell: the source PSCell of the last SN change. The source PSCell could be E-UTRA cell or NR cell.
2. CGI of the Failed PSCell: the PSCell in which SCG failure is detected or the target PSCell of the failed PScell change. The Failed PSCell could be E-UTRA cell or NR cell.
3. timeSCGFailure: the time elapsed since the last PSCell change initialization until SCG failure.
4. connectionFailureType: radio link failure or SN change failure.
5. random-access related information set by the PSCell

In the following companies’ views are collected regarding which content (if agreed) would require new fields or not, depending on the exact message to use.

**Q11: Which content suggested by RAN3 LS R3-211332 require new fields in the message, if existing SCG failure messages are enhanced to support SCG MRO?**

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| **Company** | **Which content?** | **Comments if any** |
| Huawei, HiSilicon | 1) and 2) can re-use existing IEs  3) needs a new IE | Our technical analysis are as below:  1) CGI of the Source PSCell: the source PSCell of the last SN change. The source PSCell could be E-UTRA cell or NR cell.  **Comment: For an NR cell, the existing IE *CGI-InfoNR* can be re-used. For a E-UTRA cell, the existing IE *CGI-InfoEUTRA* can be re-used.**  2) CGI of the Failed PSCell: the PSCell in which SCG failure is detected or the target PSCell of the failed PScell change. The Failed PSCell could be E-UTRA cell or NR cell.  **Comment: For an NR cell, the existing IE *CGI-InfoNR* can be re-used. For a E-UTRA cell, the existing IE *CGI-InfoEUTRA* can be re-used.**  3) timeSCGFailure: the time elapsed since the last PSCell change initialization until SCG failure.  **Comment: It should be a new IE as no existing IEs provide this.** |
| Samsung | 1), 2), 3), 5) | There is the existing field, failureType to indicate the failure cause in the current SCGFailureInformation. Thus, 4) seems to be already covered.  Considering RA failure case, 5) is required, i.e. the current RA Report has covered success case only |
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**Q12: Which content suggested by RAN3 LS R3-211332 require new fields in the message, if a separate message other than existing SCG failure messages is enhanced to support SCG MRO?**

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| **Company** | **Which content?** | **Comments if any** |
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**Summary of issue 2.3.3**

**TBD**

### 2.3.4 Applicable Scenarios

RAN3 discussed the solution for the optimization of PScell change failure for MRO in case of MR-DC. RAN3 agreed it is beneficial for the NG-RAN node to receive the list of information. And the recorded and reported source/ target PSCell could be E-UTRA cell or NR cell:

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| 1. CGI of the Source PSCell: the source PSCell of the last SN change. The source PSCell could be E-UTRA cell or NR cell. 2. CGI of the Failed PSCell: the PSCell in which SCG failure is detected or the target PSCell of the failed PScell change. The Failed PSCell could be E-UTRA cell or NR cell. |

So from the LS we deduce the optimized node is NG-RAN node and the optimized scenarios should include:

* NG-EN-DC
* NR-DC
* NE-DC

But the EN-DC which only connected to EPC is not an NG-RAN node seems not in the consideration, even if EN-DC is still under RAN3’s discussion. Rapporteur thinks it is better to confirm this understanding before we discuss the detailed content adding. Whatever EN-DC connected to EPS is included, the impact specifications are:

* TS 38.331 (for NR-DC and NE-DC)
* TS 36.331 (for NG-EN-DC, and for EN-DC if any)

**Q13: Do you think EN-DC should also be the supported and the specification impact involves both TS38.331 and TS 36.331?**

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| --- | --- | --- | --- |
| **Company** | **Whether to support EN-DC** | **Does it require changes to both TS38.331/36.331** | **Comments if any** |
| Huawei, HiSilicon | No | Only 38.331 | Firstly, we agree with the above comment that EN-DC is not in the consideration.  Secondly, we would like to avoid impact to 36.331 so NG-EN-DC case is not preferred.  In general, we think only NR-DC and NE-DC are applicable scenarios, and thus only impact to TS 38.331 is expected.  It may be good to check with RAN3 on applicable scenarios if needed. |
| Samsung | Yes | Yes | Need to check RAN3 opinion if needed |
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**Summary of issue 2.3.4**

**TBD**

# 3 Conclusion

TBD

# 4 References

1. Draft\_R2-114-e\_Meeting\_Report\_v1, see https://www.3gpp.org/ftp/tsg\_ran/WG2\_RL2/TSGR2\_114-e/Report
2. R3-205662 LS to RAN2 on RACH report for SgNB, RAN3
3. R2-2103093 [Post113-e][852][NR R17 SON/MDT] 2 step RA and other SON changes (CATT)
4. R2-2104536 Report of  [AT113b-e][802][NR/R17 SON/MDT] 2 step RA and other SON enhancements (CATT)
5. RAN3\_112-e\_agenda\_with\_Tdocs20210527\_EOM2, see https://www.3gpp.org/ftp/tsg\_ran/WG3\_Iu/TSGR3\_112-e/Inbox/Drafts/Chairmans\_Notes
6. R2-2103733 Discussion on other SON aspects, Huawei, HiSilicon
7. R2-2103943 Other WID related SON features, Ericsson
8. R2-2103096 Further Consideration on PSCell MHI, CATT
9. R3-210002 Report of 3GPP TSG RAN WG3 meeting #110-e
10. R3-211332 LS on information needed for MRO in SCG Failure Report, RAN3
11. R2-2104701 Report of 3GPP TSG RAN WG2 meeting #113bis-e, Online
12. R2-2104296 Summary of AI 8.13.2.3 Other WID related SON features, vivo
13. R2-2104058 Other SON Enhancements, Samsung
14. R2-2103552 Discussion on other SON aspects, Nokia, Nokia Shanghai Bell