**3GPP TSG-RAN WG3 Meeting #107-e R3-201147**

**Electronic Meeting, February 24th – March 6th, 2020**

**Agenda item:** 13.3.2.1

**Source:** Qualcomm Incorporated

**Title:** CB: # 49\_Email049-IAB\_migration\_criteria

**Document for:** Agreement

# 1 Introduction

This document discusses:

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| **CB: # 49\_Email049-IAB\_migration\_criteria****- RLF recovery st2? (QC), (SS), (HW)****- any other aspects? (AT&T), (HW 0756), (KDDI)****- attempt agreement on “common denominator” st2 TP; merge/revise as needed; check details**(QC)Summary of offline disc R3-201147 |

**The following contributions have been considered:**

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| R3-200571 | (TP for NR-IAB BL CR for 38.401) IAB node reestablishment (Samsung) | other |
| R3-200761 | (TP for NR\_IAB BL CR for TS 38.401): Backhaul RLF Recovery (Huawei) | other |
| R3-200418 | (TP for NR\_IAB BL CR to TS 38.401) BH RLF recovery (Qualcomm Incorporated) | otherMove to 13.3.2.1 |
| R3-200637 | (TP for NR-IAB BL CR for TS 38.473): F1AP signaling to indicate IAB node congestion (AT&T) | discussionMove to 13.3.2.1 |
| R3-200756 | CP based E2E flow control for IAB (Huawei) | discussionMove to 13.3.2.1 |
| R3-200319 | Considerations on Intra-CU topology adaptation procedure (KDDI Corporation) | discussionMove to 13.3.2.1 |

**These contributions cover the following distinct topics:**

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| [R3-200571](file:///C%3A%5Ctemporary%5CUsers%5Cghampel%5CAppData%5CLocal%5CTemp%5CTemp1_RAN3_107-e_agenda_with_Tdocs_20200221_1346.zip%5Cdocs%5CR3-200571.zip), [R3-200761](file:///C%3A%5Ctemporary%5CUsers%5Cghampel%5CAppData%5CLocal%5CTemp%5CTemp1_RAN3_107-e_agenda_with_Tdocs_20200221_1346.zip%5Cdocs%5CR3-200761.zip), [R3-200418](file:///C%3A%5Ctemporary%5CUsers%5Cghampel%5CAppData%5CLocal%5CTemp%5CTemp1_RAN3_107-e_agenda_with_Tdocs_20200221_1346.zip%5Cdocs%5CR3-200418.zip) | **BH RLF recovery procedure** |
| [R3-200637](file:///C%3A%5Ctemporary%5CUsers%5Cghampel%5CAppData%5CLocal%5CTemp%5CTemp1_RAN3_107-e_agenda_with_Tdocs_20200221_1346.zip%5Cdocs%5CR3-200637.zip), [R3-200756](file:///C%3A%5Ctemporary%5CUsers%5Cghampel%5CAppData%5CLocal%5CTemp%5CTemp1_RAN3_107-e_agenda_with_Tdocs_20200221_1346.zip%5Cdocs%5CR3-200756.zip) | **F1AP congestion notification** |
| [R3-200319](file:///C%3A%5Ctemporary%5CUsers%5Cghampel%5CAppData%5CLocal%5CTemp%5CTemp1_RAN3_107-e_agenda_with_Tdocs_20200221_1346.zip%5Cdocs%5CR3-200319.zip) | **Intra-CU topology adaptation** |

**BH RLF recovery procedure**

The three contributions discuss intra-CU BH RLF recovery procedures for SA mode. R3-200418 also discusses inter-CU BH RLF recovery for SA mode as well as intra/inter-CU BH RLF recovery for NSA mode.

These contributions have been merged in the TP to IAB BL CR to TS 38.401 below.

The following issue has been identified:

**How does the IAB-node identify if a parent node selected for recovery belongs to the same or a different IAB-donor CU?**

**Option 1: The IAB-node is pre-configured with the local CU gNB-ID.**

**Option 2: The CU sends the gNB-ID to the IAB-node (e.g. via RRC).**

***Please provide your view on Option 1 vs. Option 2.***

***Please review the TP in section 4 and propose corrections/additions as necessary.***

**Ericsson:** this enhancement is not necessary for non-mobile IAB nodes. We think that it is highly unlikely that a node will try to reconnect to a cell other than the original one and it is also very unlikely that the best cell is another cell than the one which was first camped. Besides, if the MT tries to connect to a cell under another CU, that CU can reject and redirect it to another cell.

Please see some changes on the TP as well.

Huawei: Firstly, we agree with Ericsson that the IAB node is fixed for R16 and the IAB node select a parent node be served by a different donor CU is corner case, we do not need to set such constraint for IAB node to perform recovery. And then, even if IAB node want to connect to parent node under same donor CU, the IAB node can identify the parent node becomes to the same or a different IAB-donor CU from the NCGI of the parent node, because the gNB ID is included in the NCGI, no need special solution with standardization impact.

ZTE: Based on 38.300,the CU ID can be identified by NR cell identity (NCI) which contains the gNB ID, so no additional indication is needed.

Samsung: we feel there is benefit to let IAB-MT node know that it re-connects to the original IAB donor CU. This can be 1-bit indication in RRCReestablishment (Msg4) message. Note that, this information is not help the IAB-MT select the cell during the re-establishment, while it aims at helping IAB node to skip some unnecessary procedures (e.g., OAM configuration downloading, SCTP association establishment, F1 setup, etc.) Our considerations come from the following aspects:

* Technically, NR CGI cannot be used to deduce whether the re-connected parent node belongs to the same IAB donor CU or not since the gNB ID length in NR CGI is not known to the IAB node.
* Based on the current re-establishment procedure, it is not guaranteed that the IAB-MT can re-connect to the original cell or original IAB donor CU. However, since Rel-16 only takes the fixed IAB node into account, with appropriate deployment, the IAB node is unlikely to re-connect a different IAB donor CU.
* Under the above assumptions for Rel-16, we can then check the benefit of letting IAB node know whether the re-connected cell belongs to original IAB donor CU. After IAB-MT re-connects to the network, the following actions are downloading OAM configuration, set up SCTP association, set up F1 interface, etc. Those procedures are triggered by IAB node. If the IAB node re-connects to the original IAB donor CU, those IAB-node triggered procedures can be skipped. However, in the real case, after IAB-MT re-connects to the network, there is no means to tell the IAB node whether the re-connected cell belongs to its original IAB donor CU or not. Based on those considerations, we feel it is benefit to inform the IAB-MT that it reconnects to the original IAB donor CU when sending RRCReestablishment (Msg4) message; then, with this information, IAB node can skip several unnecessary procedures. Some companies may say, for Rel-16, we can assume the IAB node always re-connect to the original IAB donor CU. Then, the above IAB-node triggered procedure can be by default skipped. It may be workable. However, on one hand, it increases operator configuration burden; on the other hand, it is not a future-proof way.

For TP, we are OK to Ericsson’s revision.

Nokia: This may be solved by the IAB’s implementation. For example, the IAB-DU is configured with the IP address of Donor-CU. After RLF recovery, the IAB may be configured by the OAM, i.e. the IP address of the target Donor-CU. In case IAB node detects the IP address of Donor-CU is changed, the IAB node need to re-initiate SCTP setup, then F1 setup, etc.

**CATT: We should add the Option 3, via system information( nothing else need to do).**

As gNB-CU could be identified by gNB ID, and the gNB id is part of the NR CGI, as below:

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| >>gNB ID | M |  | BIT STRING (SIZE(22..32)) | Equal to the leftmost bits of the *NR Cell Identity* IE contained in the *NR CGI* IE of each cell served by the gNB. |

In Uu interface, NR CGI is broadcasted as *CellIdentity* in SIB1 [3].

Therefore, during the cell selection phase after RLF, the IAB node knows whether this cell is an IAB capable cell, and whether this cell belongs to the same donor CU, then it decides whether to select it for recovery.

**Summary: Four companies believe that the issues can be resolved via implementation. Two companies prefer to have some form of indicator that helps the IAB-node identify if the IAB-donor is the same. One of these two companies seems to be rather flexible.**

**Even though the normative solution proposed is rather simple, there simply isn’t enough support. I believe, however, that it is worth adding to the stage-2 text that it is up to implementation how the IAB-node discovers if the donor CU is same or not. I have included this in the TP below.**

**F1AP congestion reporting**

The two contributions propose that the IAB-node reports congestion-related information via F1-AP to the CU-CP. In this manner, the CU-CP can apply congestion alleviation measures such as changes to resource configuration or changes to topology and routing.

Both contributions propose leverage the GNB-DU STATUS INDICATION message for such congestion reporting. The discussion will therefore focus on extensions to this message only.

R3-200637 proposes that the IAB-node reports congestion in binary format (congested/non-congested) per DU. R3-200756 proposes reporting of congestion or link load with child link granularity.

Companies are invited to provide their view on the support of this feature. Rapporteur has enclosed the TP to BL CR 38.473 from R3-200637, which can serve as baseline.

***Please provide feedback on the following questions:***

***Q1: Should congestion reporting via F1AP GNB-DU STATUS INDICATION be supported in Rel-16 IAB?***

Huawei: Yes

***Q2: If yes, with what granularity (e.g. per DU, per child link, etc).***

Huawei: we prefer per child link, from our point view, the current overload indication in gNB-DU STATUS INDICATION is a per DU level report, per child link reporting enhancement is beneficial to let the CU-CP know which link is congested.

**Ericsson:** this issue is within the Rel17 scope and should not be treated within Rel16.

ZTE: agree with Ericsson.

Samsung: agree with Ericsson and ZTE. Meanwhile, the existing Rel-16 SON/MDT also consider the resource status report among network loads. We can revisit this issue after Rel-16 works are finished.

Nokia: This may be beneficial, but it may be too late to discuss the detail. Suggest discuss it in Rel-17.

CATT: Too late to discuss in Rel-16, suggest to discuss it in Rel-17.

**Summary: Five companies believe that congestion reporting should not be captured in Rel-16. One company is in favour of congestion reporting in Rel-16. Based on this outcome, we will discuss congestion reporting in Rel-17.**

**Intra-CU topology adaptation procedure**

This topic is handed by email discussion **CB: # 50\_Email050-IAB\_migration\_same\_donor** and will not be addressed here.

# 3 Conclusion

Three topics were addressed in this CB:

1. **How does the IAB-node identify if a parent node selected for recovery belongs to the same or a different IAB-donor CU.**

Four of six companies believed that this can be handled via implementation. This was included as a note in the TP for BL CR to 38.401 on BH RLF recovery.

1. **Should congestion reporting via F1AP GNB-DU STATUS INDICATION be supported in Rel-16 IAB and with which granularity.**

Five out of six companies believe that this should be done in Rel-17.

1. **Modification to Intra-CU topology adaptation procedure**

This topic was handled by email discussion CB: # 50\_Email050-IAB\_migration\_same\_donor.

A TP for IAB BL CR to TS 38401 on BH RLF Recovery was discussed and revised. The following proposal is made:

**Proposal: Include the TP in R3-201363 into IAB BL CR to TS 38401.**

# 4 TP for IAB BL CR to TS 38.401: RLF Recovery

START OF CHANGE

### 8.2.z Intra-CU Backhaul RLF recovery for IAB-nodes in SA mode

The intra-CU backhaul RLF recovery procedure SA mode enables migration of an IAB-node to another parent node underneath the same IAB-donor-CU, when the IAB-node’s MT declares a backhaul RLF. The declaration of backhaul RLF is described in TS 38.331 [yy].

NOTE: Declaration if recovery occurs at the same or a different IAB-donor CU is up to implementation.

Figure 8.2.v-1 shows an example of the BH RLF recovery procedure for an IAB-node in SA mode. In this example, the IAB-node changes from its initial parent node to a new parent node, where the new parent node is served by an IAB-donor-DU different than the one serving its initial parent node.



**Figure 8.2.z: IAB intra-CU backhaul RLF recovery procedure for an IAB-node in SA mode**

1. The IAB-node MT declares BH RLF as described in TS 38.331 [yy], clause 9.2.7.
2. The MT of an IAB-node undergoing recovery from RLF conducts the RRC re-establishment procedure at the new parent node, as defined in clause 8.7. In this procedure, the IAB-donor-CU may provide new TNL address(es), which are anchored at the recovery-path IAB-donor-DU, to the IAB-node’s MT via RRC signalling.

3. The remaining part of the procedure follows steps 11-15 of the intra-CU topology adaptation procedure defined in clause 8.2.x.

Descendant node(s) of the IAB-node recovering from RLF may also need to switch to new TNL address(es) anchored in the target-path IAB-donor-DU, following the same mechanism as described for IAB intra-CU topology adaptation procedure in clause 8.2.x.

END OF CHANGE

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