3GPP TSG-RAN WG2 Meeting #109bis\_e R2-20xxxxx

Electronic meeting, 20th April to 24th April 2020

Agenda Item: x.x.x

Source: Ericsson (rapporteur)

Title: RRC Open issues for IAB

Document for: Discussion, Decision

# Introduction

This document captures the following email discussion:

* [Post109e#35][IAB] RRC Open Issues (Ericsson)

Scope: Progress RRC Open Issues. Including Establishment of the F1-C-over-LTE/X2 path. See also Open Issue list distributed by WI rapporteur. Removal of Editor’s Notes.

Intended outcome: Solutions, agreeable CR//TP.

Intended outcome 2: Open Issues list with RRC impact (April 1)

# Known Open issues

Below the remaining editor’s notes in the endorsed IAB RRC CRs [1][2] are discussed. There were no editor’s notes in 36.331, so the discussion is only about 38.331.

## Issue IAB\_1 (Additional information in BAP configuration)

5.3.5.X BAP configuration

Editor’s note: It is FFS if other information should be included in the BAP configuration.

**Question 1: Companies are invited to comment on what additional information should be included in the BAP configuration**

|  |  |
| --- | --- |
| Company | Suggested resolution/company comments |
| Huawei | We need to add the configuration on whether flow control feedback per BH RLC channel and/or flow control feedback per routing ID is enabled by CU.  Followings have been agreed by email in [Post109e#01][Org] Updates to agreements and email disc   |  | | --- | | **Resolution:** Based on the outcome of email discussion [AT109e][021][IAB] the following is agreed:   * The polling control PDU only includes D/C, R and PDU type fields (i.e. no type indication). * Flow control feedback per BH RLC channel and flow control feedback per routing ID can be simultaneously configured to child IAB node. * If only one type is configured by CU, IAB node should only report the configured type. If both types are configured by CU simultaneously, IAB node should report both types. | |
| Kyocera | Not strong opinion, but we’re wondering if the IAB donor may configure the IAB node with Flow Control and/or possibly BH RLF Notification function(s), i.e., enable/disable. |
| vivo | We think there is sufficient information in BAP configuration to properly work |
| Nokia | **Default link:** We think we cannot always assume that IAB-MT is not configured with NR-DC at the time when the BH RLC channel is used. Therefore, since BH RLC channel ID is cell group specific, we should indicate the default link (MCG or SCG) in the configuration as well.  We also agree with Huawei and Kyocera that we need to address flow control anb BH RLF notifications configuration. |
| QC | We agree with HW and Kyocera.   * Flow control feedback per RLC channel and/or per routing ID should be enabled/disabled. * RLF notification should also be enabled/disabled.   We believe that Nokia’s issue is a corner case. We could add optional MCG/SCG indicator just to make sure donor and IAB-node are aligned. |
| Intel | Agree that flow control feedback per backhaul RLC channel and per routing ID should each be enable/disable. |
| LG | As agreed in the last meeting, Flow control feedback per RLC channel and/or per routing ID and BH RLF notification should be included in BAP configuration. |
| KDDI | Agree with QC |
| Lenovo | The explicit enabled/disabled of flow control feedback is not needed. If IAB-MT receive configuration of flow control feedback per BH RLC channel and flow control feedback per routing ID, it implies ‘enabled’. Otherwise, it is ‘disabled’.  The explicit enabled/disabled of RLF notification is needed. |
| Ericsson | We agree with the comments above regarding flow control configuration.  With regard to Nokia’s comment about indication of MCG/SCG for the default BH RLC channel, we think that is a corner case and can easily be fixed in the need conditions/field descriptions for that field (i.e. IAB can assume it to be the MCG in case of NR-DC, or the SCG in case of EN-DC) |

**Summary**: There seems to be a consensus to add flow control configuration info in the BAP configuration. Two companies pointed out that BH RLF notification enabling/disabling to be also the BAP configuration. However, that message is sent from the parent to the child (i.e. IAB-DU to IAB-MT), hence part of the DU’s configuration and the rapporteur’s understanding is that this should be configured via F1 not RRC.

One company proposed to include also an indication, in case the IAB-MT is already in DC mode when it starts using BH RLC channels for the first time, clarifying whether the default BH RLC channel is in the MCG or SCG. However, this is a corner case, and the rapporteur proposes a clarification in the field descriptions is sufficient.

**Proposal 1:** **An IE to be included in the BAP configuration, to indicate if the flow control is per BH RLC channel or/and per routing ID.**

**Proposal 2:** **A clarification to be made in the field description of the default BH RLC channel IE in BAP configuration, indicating that, for the case that IAB-MT is in DC mode:**

1. **If the IAB-MT is operating in (NG)EN-DC, the default BH RLC channel is referring to an RLC channel on the SCG;**
2. **Otherwise, it is referring to an RLC channel on the MCG.**

## Issue IAB\_2 (RRC Release to INACTIVE)

5.3.8.3 Reception of the *RRCRelease* by the UE

Editor’s note: It is FFS if IAB node supports INACTIVE mode and if so, if there is a need for the BAP entity to be released/suspended on transition to INACTIVE mode.

Though some IAB-MTs may support this feature while others might not, the rapporteur does not think there is a need to capture anything in the spec regarding the BAP entity, as there is no BAP suspend procedure to be applied (as compared to the PDCP case, where the sequence numbers have to be reset and buffered data has to be discarded or delivered).

**Question 2: Do companies agree with the proposed way forward that no specific handling of the BAP entity is required during the transition of an IAB-MT to INACTIVE state?**

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| --- | --- |
| Company | Comments |
| Samsung | Since EN said two aspects, please clarify those two questions. For support of Inactive mode, we think that there is not much motivation to support inactive since IAB MT will be stationary, and there could be enough power source. We think in most of time, IAB node will be connected, and in some error cases IAB MT will go idle. Two state seems to be enough.  For support of BAP entity release/suspend, we don’t think there is the specification on this based on that there is no Inactive state. |
| Huawei | Fine with the proposed WF. But, just need to clarify if that means we support the RRC inactive state for IAB-MT. |
| CATT | It seems useful to clarify the question a bit.   * We’ve agreed that BAP entity is released upon transition to IDLE. * It has been captured in 331 that when IAB MT receives bap-config set to release, the BAP (MT) entity is released.   Then further question is about the behaviour whether RRCRelease includes suspendConfig can be sent to IAB MT, and if yes what is the behaviour.  In our view the simplest way is to add some clarification in 331 that if RRCRelease includes suspendConfig is received, then BAP entity is released and essentially IAB MT then behaves like a UE. |
| Kyocera | We agree with the rapporteur’s way forward for now. We agree with Samsung just for “Wide-area IAB-MT” that it’s usually in RRC Connected and has enough power source, but we’re not sure if it’s case for “Other-type IAB-MT”. So, we would prefer to keep RRC INACTIVE as it is at this point. We think no special handling for BAP during transitions to RRC INACTIVE is needed at this point. |
| vivo | We are fine with the way forward. |
| Nokia | Yes, we agree with the way forward. IAB-MT will very unlikely support Inactive mode in Rel-16, so we should not address Inactive-specific issues in specifications. For this particular topic, it also seems there is no need to release the entity whenever IAB-MT goes to Inactive. If after resuming the connection, Donor CU identifies the need to update BAP configuration, it may do so. |
| QC | We are fine with the way forward. |
| AT&T | OK with the proposed WF. |
| Intel | Fine with way forward |
| LG | The proposed way forward is fine. Furthermore, we are also fine to have an agreement that R16 IAB-MT does not support RRC\_INACTIVE state. |
| KDDI | Fine with the proposed WF. |
| Futurewei | We don’t see any need for the IAB-MT to support RRC INACTIVE state, at least in Rel. 16. However, it seems that a majority of companies do not want to add anything to specifically preclude this either.  It probably does not make much sense for RAN2 not to specify handling of the BAP entity in case of a transition of the IAB-MT to RRC INACTIVE. Leaving the status of the BAP entity up to implementation would seem to present an interoperability challenge. One IAB node implementation may select to release the BAP entity, while another implementation may choose to freeze the BAP configuration as is, or any other implementation between these two extremes. It is not clear how the donor would then become aware of the BAP entity configuration upon the IAB-MT resuming RRC CONNECTED state.  If we do not preclude RRC INACTIVE for an IAB-MT, then we think RAN2 should select between the following two possible solutions:   * Option 1: BAP entity is released upon transition of IAB-MT to RRC INACTIVE * Option 2: BAP entity configuration is not changed upon transition of IAB-MT to RRC INACTIVE   Between these two options, we think Option 2 would be the more logical approach. |
| Lenovo | I am fine with this WF. I wonder if it implies IAB MT support inactive mode? |
| Sharp | We are fine with the way forward. |
| ZTE | We think IAB-MT doesn’t need to support INACTIVE state. Correspondingly, it is not necessary to consider the BAP entity handling during the transition of IAB-MT to INACTIVE state. |
| Ericsson | Fine the way forward. |

**Summary**: There seems to be a consensus that even if IAB-MT supports inactive state, no special IAB related handling is required. Thus, the rapporteur proposes to remove the FFS.

**Proposal 3:** **The FFS related to INACTIVE state to be removed.**

## Issue IAB\_3 (RRC connection without a DRB)

5.3.10.3 Detection of radio link failure

Editor’s note: FFS if the check for SRB2 activation and the setup of one DRB is applicable to IAB nodes.

This editor’s note also affects the following clauses where SRB2 activation/DRB setup are referenced.

5.3.1.1 RRC connection control

*A configuration with SRB2 without DRB or with DRB without SRB2 is not supported (i.e., SRB2 and at least one DRB must be configured in the same RRC Reconfiguration message, and it is not allowed to release all the DRBs without releasing the RRC Connection).*

5.3.5 RRC reconfiguration

*the reconfigurationWithSync is included in masterCellGroup only when AS security has been activated, and SRB2 with at least one DRB are setup and not suspended.*

5.3.7 RRC connection re-establishment

*If AS security has been activated, but SRB2 and at least one DRB are not setup, the UE does not initiate the procedure but instead moves to RRC\_IDLE directly, with release cause 'RRC connection failure'.*

5.3.8 RRC connection release

*The purpose of this procedure is:*

*- to release the RRC connection, which includes the release of the established radio bearers as well as all radio resources; or*

*- to suspend the RRC connection only if SRB2 and at least one DRB are setup, which includes the suspension of the established radio bearers.*

5.4.3 Mobility from NR

*the procedure is initiated only when AS security has been activated, and SRB2 with at least one DRB are setup and not suspended.*

The rapporteur’s understanding is that there were diverging opinions during RAN2#109e whether an RRC connection must be setup/configured with at least one DRB or not. Some companies expressed the opinion that they wanted to configure DRBs. Some other companies expressed the opinion that they did not want to configure DRBs. Yet, RAN3 agreed that configuring a DRBs is optional and may only be needed for OAM purposes. Thus, both types of configurations shall be allowed.

The rapporteur suggests that the aforementioned clauses of the RRC spec are updated to allow an RRC connection with/without a DRB.

**Question 3: Do companies agree with the proposed way forward for allowing an RRC connection without configuring a DRB is valid?**

|  |  |
| --- | --- |
| Company | Suggested resolution/company comments |
| Samsung | Agree that RRC procedure can be performed even in the case without DRB for IAB. |
| Huawei | No strong view on this. But:  The motivation to change the RRC text is to support the case that RRC does not configure DRB if IAB-MT does not support the DRB feature. However, If we are discussing the IAB-MT’s capability to support DRB as optional feature, it should be discussed in the feature list topic.  We should postpone this for now. |
| CATT | We are generally fine with allowed SRB only configuration for IAB MT.  But agree with HW above that we could check further what would be the implications. |
| Kyocera | We agree with the rapporteur’s way forward. |
| vivo | We agree to allowing an RRC connection without configuring a DRB |
| Nokia | We do not agree with the way forward.  We have different understanding of RAN3 agreement, which says (copied from BL CR for TS 38.401):  *The transport connection between the IAB-node and its OAM, using IP, is provided by the IAB-MT’s PDU session via 5G network, or the IAB-MT’s PDN connection via LTE network when IAB-MT uses EN-DC.*  *NOTE: the transport connection between the IAB-node and its OAM may also be provided using the Backhaul IP layer by implementation.*  As shown above, using DRB for OAM is mandatory and using backhaul for OAM is by implementation. Also, configuring the DRB does not mandate using it for OAM, so all the proposed changes would be only introduced to optimize the non-standard way of establishing OAM. We do not think we should complicate the standard behaviour with so many changes just to optimize a potential implementation option. |
| QC | We agree with the WF.  We do not agree with Nokia’s interpretation of RAN3’s stage-2. RAN3 has to ensure that OAM connectivity can be provided. This way is described in the stage-2. This does not imply that this approach is the only way or that this approach is mandatory. |
| AT&T | We agree it should be possible to support RRC connections without first configuring a DRB. We don’t think this should be tied to the MT capability discussions related to mandatory DRB support (e.g. for the purpose of OAM). |
| Intel | Agree with proposed way forward |
| LG | We would like to keep the existing principle that at least one DRB should be established. This DRB will be useful at least for OAM. |
| KDDI | Agree with proposed way forward |
| Futurewei | We have the same view as Nokia. Based on our reading of the BL CR for TS 38.401, it is very clear that RAN3 assumes that *all* IAB nodes should support at least one DRB. If RAN2 now agrees that DRBs are optional for IAB nodes, we would have to LS RAN3 to reconsider this, and change their specs accordingly.  In addition, as the e-mail discussion rapporteur has correctly indicated, such an agreement would entail rather extensive updates to 38.331. Also, it seems we would also need to make similar changes to 36.331 to address the ENDC case (which would open another can of worms).  Therefore, we can not agree to the proposed WF, as these changes to the spec would be completely unnecessary. |
| Lenovo | I have no strong view. But, if the above part in the specification is modified to support active IAB MT without DRB. It may make description complex.  In addition, we also need to consider HW’s comment. |
| ZTE | We admit that it is not necessary for IAB node MT to be configured with one DRB if OAM traffic is delivered via IP layer. However, it is not clear how donor CU could identify whether the IAB-MT delivers the OAM traffic via PDU session or via IP layer and then determine whether one DRB should be configured for IAB-MT along with the SRB2. From the perspective of reducing specification impact, we think it would be better to keep the IAB MT aligned with normal UE to be configured with at least one DRB. |
| Ericsson | We agree with QC’s comment. What Nokia quoted is a stage 2 description and not normative text. In the same spec (38.401), during the description of the IAB integration procedure, it is stated that:  Phase 1: IAB-MT setup. In this phase, the MT functionality of the new IAB-node (e.g. IAB-node 2 in Figure 8.z.1-1) connects to the network as a normal UE, by performing RRC connection setup procedure with IAB-donor-CU, authentication with the core network, IAB-node 2-related context management, IAB-node 2’s access traffic-related radio bearer configuration at the RAN side**, and, optionally, OAM connectivity establishment by using the IAB-MT’s PDU session.**  Thus, our understanding is that OAM connectivity can be provided via BH RLC channels or via DRB, and none of the two is mandatory.  With regard to Huawei’s comment: *The motivation to change the RRC text is to support the case that RRC does not configure DRB if IAB-MT does not support the DRB feature*, we would like to clarify that even if an IAB-MT supports DRBs, the network could still opt to use BH RLC channels for OAM. |

**Summary** Except for three companies, the other companies are either supportive or neutral about allowing an RRC connections without configuring a DRB (12 companies supportive, 4 have no strong view).

**Proposal 4:** **An RRC connection without a DRB is allowed.**

## Issue IAB\_4 (IAB Common Search Space List)

6.3.2 Radio resource control information elements

*PDCCH-ServingCellConfig* information element

-- ASN1START

-- TAG-PDCCH-SERVINGCELLCONFIG-START

PDCCH-ServingCellConfig ::= SEQUENCE {

slotFormatIndicator SetupRelease { SlotFormatIndicator } OPTIONAL, -- Need M

...,

[[

availabilityIndicator-r16 SetupRelease {AvailabilityIndicator-r16} OPTIONAL, -- Need M

commonSearchSpaceListIAB-r16 SEQUENCE (SIZE(1..maxNrofFFS)) OF SearchSpace OPTIONAL -- Need FFS (R)

]]

}

-- TAG-PDCCH-SERVINGCELLCONFIG-STOP

-- ASN1STOP

The length of the list for *commonSearchSpaceListIAB-r16* was not decided.

The rapporteur suggests having a list of 4 common search spaces similar as what it is for UEs.

**Question 4: Do companies agree with the proposed way forward for the *commonSearchSpaceListIAB-r16* list to have up to 4 elements?**

|  |  |
| --- | --- |
| Company | company comments |
| Samsung | We agree with the rapporteur suggestion. |
| Huawei | We want to further check this configuration. |
| Kyocera | We agree with the rapporteur’s way forward. |
| vivo | We agree |
| Nokia | Shouldn’t this be decided by RAN1? |
| QC | I think 4 is the right number but I will follow up with RAN1 folks. |
| AT&T | We should let RAN1 discuss/decide this value in the upcoming e-meeting. |
| Intel | Agree with proposed way forward |
| LG | Until now, we have not identified a reason to extend the value. Thus, we agree with the rapporteur’s suggestion. |
| KDDI | We prefer to leave it to RAN1 decision. |
| Futurewei | No strong opinion |
| Lenovo | Better to be decided by RAN1 |
| ZTE | We agree with this way forward. |
| Ericsson | We agree with the comment from Nokia hat this would have been better decided by RAN1. However, since RAN1 is in maintenance mode when it comes to IAB rel-16 work, our proposal would be to agree with this value and if required, notify RAN1 about our decision with an LS. |

**Summary**: There is a consensus to use the value of 4. However, some companies have rightfully pointed out this should have been handled by RAN1. However, since RAN1 is in maintenance mode regarding release 16, the rapporteur proposes to agree with the way forward. An LS can be sent informing RAN1 about this and any other agreement that is related to RAN1.

**Proposal 5:** **The *commonSearchSpaceListIAB-r16* list to have up to 4 elements.**

**Proposal 6:** **An LS to be sent to RAN1 informing about this decision (and possibly including other agreements that are relevant to RAN1).**

## Issue IAB\_5 (maximum LCID)

6.4 RRC multiplicity and type constraint values

*maxLC-ID-Iab-r16 INTEGER ::= FFS*

RAN3 has agreed to limit the maximum number of logical channels to 16,384 (2^14). RAN2 could still use the full range of IDs 65,536 even if it can only address to 16,384 logical channels. It is unclear what is the purpose or use of having a larger range of IDs than the number of logical channels which can be configured. Note that this also affects the MAC.

The rapporteur proposes to set the maximum value to 16,384, aligning to what RAN3 has decided. In the MAC spec, the values from 16385 to 65,536 can be left as reserved.

*maxLC-ID-Iab-r16 INTEGER ::= 16384*

**Question 5: Do companies agree with limiting the maximum value for the BH LCIDs to be 16384 to align with RAN3 agreements?**

|  |  |
| --- | --- |
| Company | Suggested resolution/company comments |
| Samsung | Agree. |
| Huawei | Disagree.  As agreed in the MAC CR, we have total values from 320 to (216 + 191) for extended LCH for BH RLC. In addition to the legacy 32 values of LCH for BH RLC, the total number of BH RLC should be: 216-128(reserved) +32 (legacy)=**65440**.   |  |  | | --- | --- | | Index | LCID values | | 320-(216 + 191) | Identity of the logical channel | | (216 + 192)-(216 + 319) | Reserved |   Apparently, R3 made the decision without knowing the R2 agreements.  Note that the value from 320 to (216 + 191) can only be used for IAB. If MAC supports (as agreed to extend 16 bits and 128 reserved values) so many LCID values, there is no motivation to only use 214 for BH RLC.  The proposed 16384 means we need to change the MAC spec and reserve values as (216-214 ). If 214 is enough for IAB BH RLC, why did R2 agree to extend 16 bits eLCID for IAB? |
| CATT | We do not see a big issue to align with R3 agreements. But on the other hand, if this can be clarified and if there is no particular reason of not supporting LCID value in full range, maybe we could get this done now.  Some x-checking with R3 may be useful. Or companies have strong concern may initiate discussion in R3 and then notify R2 if any changes to their conclusion. |
| Kyocera | We agree that the maximum value is aligned between RAN2 and RAN3, but we don’t have strong view on which agreements is valid, 16384 (as rapporteur suggested or 65440 (as Huawei pointed out). |
| vivo | We agree |
| Nokia | We disagree with the proposal. We think RAN3 was not aware of what is available on the air interface when making their decision and RAN3 should align with what is available in MAC. This should not be a problem for network signalling and keeping 50 000 reserved values is rather strange.  The maximum value should be aligned with MAC, i.e. 216+191. |
| QC | RAN3 made a mistake when they limited the number to 16k. This issue is already on RAN3 agenda to be fixed in this meeting. |
| LG | Disagree.  Even though the MAX LCID value is aligned with MAC, i.e., 216 + 191, we don’t see any problems. However, if Max LCID value is changed to 16384 as defined in RAN3, it is quite odd to have around 50000 reserved values in MAC spec. Furthermore, we do not need to make a conclusion in this email discussion and can wait RAN3 decision until RAN3 fixes this issue in this meeting, as pointed out by QC. |
| KDDI | We think that RAN2 can wait RAN3 fixing the mismatch problem. |
| Futurewei | We also disagree with the proposal.  We don’t understand the rationale for RAN3 to limit the maximum number of logical channels to 16,384. We believe that this is in the scope of RAN2, and we already agreed on the range for extended LCIDs. Therefore, it seems that RAN3 should align their spec to what has already been agreed by RAN2. |
| Lenovo | If RAN3 revisits its agreement, we can wait for RAN3 further agreement. |
| ZTE | It is suggested to keep aligned with RAN2 and RAN3. However, it is not clear to us why only 16384 LCIDs are considered in RAN3 instead of 65440. From RAN2 perspective, we think 65440 is a good choice. |
| Ericsson | In our view, alignment is required between the RAN3 and RAN2 values. And, as QC has pointed out, if RAN3 is going to change the range to allow 65440 values, then we can leave the RAN2 values as is. |

**Summary**: There is a consensus to have the RAN2 and RAN3 values aligned. The issue is whether to align the RAN3 values to the RAN2 or the other way around. Some companies have pointed out that RAN3 may correct the value range and align it with the RAN2 value. Assuming that is done, no changes will be required to RAN2 specs.

**Proposal 7:** **Under the assumption that RAN3 will align the value range of the backhaul RLC channels to the one currently specified in RAN2, no changes are required in RAN2. If RAN3 maintains their current agreement of 2^14 values, RAN2 values will be updated to align with that.**

# Other issues

The following open issues were raised during RAN2-109e discussion and earlier phases of this email discussion.

## Issue IAB\_6 (F1-C signalling over LTE)

When an IAB MT is connected via EN-DC, it has been agreed to support the transfer of the F1-C messages encapsulated via LTE RRC message and the endorsed CRs [1] [2] capture that to some extent. However, some open issues still remain [3]:

* *Whether this will be an optional feature and if so, how to signal that capability?*
* *How to configure the IAB node to send F1-C over LTE or NR?*
* *Whether both the LTE or NR path can be used for F1-C signaling (in the UL)?*

**Question 6: Do companies agree that supporting F1-C signalling via the LTE while operating in EN-DC mode is an optional feature for the IAB?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Huawei | Yes | This was agreed in last meeting:  “F1AP over LTE leg signaling for EN-DC IAB-MT” is an optional feature/capability.” |
| CATT | Yes |  |
| Kyocera | Yes |  |
| vivo | Yes |  |
| Nokia | Yes | This particular aspect has been already agreed in RAN2#109-e meeting:   * “F1AP over LTE leg signaling for EN-DC IAB-MT” is an optional feature/capability. |
| QC | Yes |  |
| AT&T | Yes |  |
| Intel | Yes |  |
| LG | Yes |  |
| KDDI | Yes |  |
| Futurewei | Yes | As indicated by other companies, this has already been agreed. |
| Lenovo | Yes |  |
| Sharp | Yes |  |
| ZTE | Yes | Based on RAN2#109e agreements, F1AP over LTE leg signaling for EN-DC IAB-MT” is an optional feature/capability. |
| Ericsson | Yes |  |

**Summary**: There is a consensus that the F1-C transport via LTE is an optional feature.

**Proposal 8:** **To confirm that for the case of EN-DC, F1-C transport over LTE is an optional feature.**

**Question 7: Companies are invited to give input regarding on how the IAB node can be configured to use the LTE or NR legs to send F1-C.**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | NR RRC signaling is used to configure whether to allow MT to use LTE/NR/Both link, e.g. ENUMERATED {lte, nr, both}.  If LTE link is allowed to send F1-C as configured by NW, it is IAB’s implementation when to use LTE link, e.g. upon NR RLF. |
| Nokia | We propose that selection of the F1AP transfer path should be configured by NR RRC and included in the *nr-SecondaryCellGroupConfig*. Please see R2-2001057 for details and the related TP.  We are not sure whether we should allow “both” to be configured as proposed by Huawei. This may cause some issues, for example with duplicate detection etc. if this is left to IAB node implementation. If it is not, then there is additional specifications complexity, which we should avoid at this stage of Rel-16, so it would be safer to have only a single path configured at a time. |
| QC | As long as the LTE/X2 path is supported, there is no reason to put any unnecessary restrictions on its usage  It should be possible, for instance, to use the LTE/X2 path before the NR path is available, i.e. for F1 SETUP handshake.  If both paths are simultaneously available, path selection should follow the same rules as for multi-connected IAB-nodes using SA, or for a multi-homed gNB-DU in a wireline network. The latter two cases are currently treated as identical and path selection for F1-C is left up to implementation. |
| AT&T | Agree with QC, it is beneficial to align the ENDC case with the SA functionality as much as possible and leave freedom for the usage of the LTE leg to implementation. |
| LG | We think explicit indication {lte, nr} is sufficient. Not essential to allow using “both”. Qualcomm suggestion is also fine. |
| KDDI | Agree with QC and AT&T. |
| Futurewei | Agree with HW and Nokia. This should be configured via NR RRC. We would prefer not to impact LTE RRC, if possible.  The details of this configuration should be discussed based on contributions. |
| Lenovo | Agree with QC. |
| ZTE | The selection by the IAB node between LTE or NR leg to send F1-C could be left to implementation. |
| Ericsson | We agree with QC/AT&T, that path selection can be left up to implementation. |

**Summary**: Some companies want the path selection for F1-C in case of EN-DC to be explicitly configured via RRC, while others prefer to leave this for network implementation

**Proposal 9:** **In phase 2, to decide among these two for paths selection of F1-C messages in EN-DC:**

1. **Explicitly configured via RRC;**
2. **Left to network implementation.**

## Issue IAB\_7 (Failure cause for SCG(MCG)FailureInformation triggered due to BH RLF)

Another issue pointed out by Lenovo and Samsung during the early stages of this email discussion was regarding failure types to indicate during SCG failure recovery. According to the IAB CRs [1][2], the UE performs SCG failure information procedure upon the reception of BH RLF indication from the BAP entity of the SCG. The *SCGFailureinformation* message includes the failure type, and currently the failure type can take one of the following values:

*failureType                                  ENUMERATED {*

*t310-Expiry, randomAccessProblem,*

*rlc-MaxNumRetx, synchReconfigFailureSCG,*

*scg-ReconfigFailure,*

*srb3-IntegrityFailure,  spare2, spare1}*

If one of the values are used also for the case of BH RLF, the donor CU will not be able to differentiate between problem that are actually experienced on the SCG link and problems on the backhaul link of the SCG.

**Question 8: Do companies agree that a new cause value needs to be introduced for *SCGFailureInformation* to indicate BH RLF from the SN?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Huawei | Yes | Should be fine. |
| Kyocera | Yes | We assume a new cause value is something like “BH RLF Notification reception”. |
| vivo | Yes | It is ok. |
| Nokia | Yes | It seems there is no failure type which could be reused directly for SCG failure triggered by BH link failure indication. |
| QC | Yes | Fine with us |
| Intel | Yes |  |
| LG | No | No new cause is needed. CU can already know through F1AP procedure which backhaul link is problematic. |
| KDDI | No | We are not fully convinced why a new cause is needed. Considering the limited spare value. We prefer to leave it as it is in release 16 and have more discussion in release 17. |
| Futurewei | Yes | We are fine with the proposal |
| Lenovo | Yes |  |
| Sharp | Yes |  |
| ZTE | Yes | A new cause value needs to be introduced to indicate backhaul link failure to donor CU. In addition, the identity of the IAB node who actually detects RLF needs to be contained in *SCGFailureInformation* to help donor CU to update routing configuration of the IAB node via MCG link. In addition, the identity of the IAB node who actually detects RLF needs to be contained in the BH RLF indication BAP control PDU. |
| Ericsson | Yes | Without a new cause value, the donor will not know if the problem was with the link to the parent or the parent’s backhaul link. |

**Summary**: Majority (11 out of 13) of the companies agree that there is a need for a new cause value to signify SCG failure recovery was triggered due to the reception of BH RLF notification from the SN.

ZTE proposed the inclusion of the IAB node’s identity in the BH RLF control PDU, which is then forwarded to the CU within the SCGFailureInformation. The rapporteur’s understanding is that the CU will know which IAB-MT is sending the SCGFailureInformation and it implicitly know what the parent (SN) of that IAB node is.

**Proposal 10:** **A new failure type value to be introduced for indicating that *SCGFailureInformation* is triggered due to the reception of BH RLF indication from the SN.**

In rel-16, the MCG failure information has been introduced for both LTE and NR, where the MCG failure information is sent via the SCG to the network instead of triggering re-establishment. Thus, if the IAB-MT supports MCG failure recovery, it will trigger the MCG failure information when receiving a BH RLF indication from the MN. The failure type for the MCG failure is currently defined as [4]:

*failureType                                  ENUMERATED {*

*t310-Expiry, randomAccessProblem,*

*rlc-MaxNumRetx, spare1}*

There are less cause values because the MCG failure recovery is triggered only for RLF (i.e. not due to reconfiguration failure, integrity check failure, etc.). That being said, the same problem as in the case of the SCG failure information also exists for the MCG failure information. The failure type for the MCG currently has only one spare value, but it has to be expanded (at least for 38.331) to support more values because the SON/MDT WI has introduced a new failure type *beamFailureRecoveryFailure* and the NR-U WI has introduced the *LBTFailure* as well.

**Question 9: Do companies agree that a new cause value needs to be introduced for *MCGFailureInformation* to indicate BH RLF from the MN?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Huawei | Yes | Should be aligned with the decision in SCG case. |
| Kyocera | Yes |  |
| vivo | Yes | It is ok. |
| Nokia | Yes | See rationale above. |
| QC | Yes | Fine with us |
| Intel | Yes |  |
| LG | No | No new cause is needed. CU can already know through F1AP procedure which backhaul link is problematic. |
| KDDI | No | We are not fully convinced why a new cause is needed. Considering the limited spare value. We prefer to leave it as it is in release 16 and have more discussion in release 17. |
| Futurewei | Yes | We are fine with the proposal |
| Lenovo | Yes |  |
| Sharp | Yes |  |
| ZTE | Yes | Similar to our comments for Question 8, a new cause value needs to be introduced to indicate backhaul link failure to donor CU and the identity of the IAB node who actually detects RLF needs to be contained in *MCGFailureInformation* to help donor CU to update routing configuration of the IAB node via SCG link. |
| Ericsson | Yes | Same comment as Q8. |

**Summary**: Majority (11 out of 13) of the companies agree that there is a need for a new cause value to signify MCG failure recovery was triggered due to the reception of BH RLF notification from the MN.

The rapporteur has similar comments to that of Q8 regarding ZTE’s proposal to include parent IAB node’s identity in the failure information.

**Proposal 11:** **A new failure type value to be introduced for indicating that *MCGFailureInformation* is triggered due to the reception of BH RLF indication from the MN.**

# Other issues

Besides the issues discussed in previous sections, companies are invited to list other open issues related to the endorsed IAB RRC CRs [1][2].

**Question 10: Any other open issues related to the IAB RRC CRs?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Just note we still have some FFS for the need code.  [Rapporteur] This is being addressed in the updated CR, which will be distributed shortly. |
| Kyocera | We would like to support IAB also in NPN (non-public network), so if we can look into the gap between IAB and PRN RRC CRs, and if any issue is identified, we would like to discuss/solve it in Rel-16.  [Rapporteur] This issue has not been discussed yet, so better to discuss via contributions in the next meeting. |
| Nokia | **The parameter type for bh-RLC-ChannelID-r16**: This is currently FFS. We propose to define this as INTEGER (1..maxBH-RLC-Channel-r16) to clearly indicate this is different from BH logical channel identity.  [Rapporteur] We think we should follow the CHOICE structure to identify and separate between legacy IDs and the extended ID. The choice structure was decided to be preferred. What this IE means is described in the field description table and shouldn’t be confused with the type defined for the IE. If Nokia concerned is that it could be misinterpreted, we are open to add further clarifications in the field description.  **BAP entity configuration:** As discussed during RAN2#109-e, the information provided by RRC can be used not only by BAP entity at the IAB-MT, but also by the BAP entity at IAB-DU (similarly, for BAP configuration provided in F1AP, it may be used by both IAB-DU and IAB-MT). That is why we replaced some occurrences of “BAP entity at the IAB-MT” with simply “BAP entity”. However, there are still some places where this was omitted and should be modified, i.e.:  - section 4.4: “Configuration of BAP entity ~~at the IAB-MT~~ [X] and BH RLC channels for the support of IAB-nodes”  - section 6.2.2, field descriptions of bap-Config, DefaultUL-BAProutingID and DefaultUL-BH-RLC-Channel (BTW: those should start with lowercase “d”)  **(U)AC:** The following agreement has not been captured in RRC (both 38.331 and 36.331):   * IAB-MTs are not under UAC control.   [Rapporteur] This is being addressed in the updated CR, which will be distributed shortly. A clarification in 38.304 is also needed, and we will prepare a draft CR for that too. |
| QC | There are further untreated FFS in the last endorsed RRC CR R2-2002122. Most of them are straightforward so we should resolve them in this discussion.  Editor’s note: **FFS** how to implement that the LCID-Ext is optional and not to be signaled if not implemented.  tdd-UL-DL-ConfigurationDedicated-iab-mt-v16xy TDD-UL-DL-ConfigDedicated-IAB-MT-v16xy OPTIONAL -- Need **FFS**  commonSearchSpaceListIAB-r16 SEQUENCE (SIZE(1..maxNrofFFS)) OF SearchSpace OPTIONAL -- Need **FFS** (R)  Tons of – NEED **FFS** in TDD-UL-DL-SlotConfig-IAB-MT-v16xy  maxNrofAssociatedDUCellsPerMT-r16 INTEGER ::= 65535 -- **FFS**  maxNrofResourceAvailabilityPerCombination-r16 INTEGER ::= 64 -- **FFS**  We should not aim for IAB support in NPN in Rel-16.  [Rapporteur] The FFSs are being addressed in the updated CR, which will be distributed shortly. |
| Sharp | A change on *iab-Support* in *PLMN-IdentityInfo***(**and possibly other IAB-specific fields in SI) should not result in transmission of SI change notifications (short message), which would enforce UEs to re-acquire SI. We think this needs to be specified in the field description, exactly like what we did for the field description of *si-BroadcastStatus.*  [Rapporteur] OK, will consider in the updated CR. |

# Phase 2 discussion

In this section, the issues where there was no consensus or majority support will be discussed. Additionally, companies are more than welcome to bring open issues that they still find in the updated CRs.

## Issue IAB\_6 (F1-C signalling over LTE)

**Question 11: Which of these two options should be used to configure an IAB node connected in EN-DC to use LTE or/and NR to send F1-C.**

1. **Explicitly configured via RRC;**
2. **Left to network implementation.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option (1/2)** | **Comments** |
| Huawei | Option 1 for enabling LTE link;  Option 2 for the link selection at IAB node. | We want to clarify the explicitly configuration should be the enabling/disabling for LTE link. The selection in case LTE link is enabled by NW can be implementation. |
| Nokia | 1 | We agreed this is an optional feature, so it has to be configurable. We think configuring both at the same time may cause issues, but as long as this would be only one of configuration options, we are OK, i.e. we can configure NR link, LTE link or both as proposed earlier by Huawei. |

## Other open issues

**Question 12: Any other open issues related to the IAB RRC CRs that companies would like to raise in phase 2?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | We have some more class 3 ASN.1 issues to input here:  1) The defaultUL-BH-RLC-Channel and bh-RLC-ChannelID should be the BH RLC channel ID, rather than the corresponding logical channel ID.  BAP-Config-r16 ::= SEQUENCE {  bap-Address-r16 BIT STRING (SIZE (10))  defaultUL-BAProutingID-r16 BAP-Routing-ID-r16 OPTIONAL, -- Need M  defaultUL-BH-RLC-Channel-r16 ~~BH-LogicalChannelIdentity-r16~~ INTEGER (0.. maxLC-ID-Iab-r16) OPTIONAL, -- Need M  BH-RLC-ChannelConfig-r16::= SEQUENCE {  bh-LogicalChannelIdentity-r16 BH-LogicalChannelIdentity-r16,  bh-RLC-ChannelID-r16 ~~BH-LogicalChannelIdentity-r16~~ INTEGER (0.. maxLC-ID-Iab-r16),  2) Based on the R1 LS, this value should be 256. Do I miss something?  maxNrofResourceAvailabilityPerCombination-r16 INTEGER ::= ~~64~~256 -- FFS  3) Not sure about the plan to implement the last meeting agreements or left to the email discussion #26.   * Confirm that R2 will implement R3 agreements   *-* RAN2 to implement IP address addition and removal in RRC [this serves merely as a reminder of the work to be done].  - RAN2 to implement in RRC the mapping between the IPv4 address(es)/IPv6 prefix assigned to the IAB node, and the related donor-DU’s BAP address RRC, when assigning the IP address to the IAB node [this serves merely as a reminder of the work to be done].  3a) Suspend BAP operation at RRC re-establishment  Upon the initiation of the RRC re-establishment, BAP should stop constructing the BAP PDU, in case the BAP routing ID to be included in the BAP header will be reconfigured after establishment at new parent.  So, Upon the initiation of the RRC re-establishment procedure, the BAP operations need to be suspended. After the success of RRC re-establishment procedure, the BAP layer operations can be resumed. This should be captured in RRC procedure as following:   |  | | --- | | 5.3.7.2 Initiation Upon initiation of the procedure, the UE shall:  1> stop timer T310, if running;  1> stop timer T304, if running;  1> start timer T311;  1> suspend all RBs, except SRB0;  1> suspend BAP operations, if configured;  1> reset MAC;  1> release the MCG SCell(s), if configured; 5.3.5.3 Reception of an *RRCReconfiguration* by the UE 2> if this is the first *RRCReconfiguration* message after successful completion of the RRC re-establishment procedure:  3> resume SRB2 and DRBs that are suspended;  3> resume BAP operations that are suspended; |   **4) Some L1 parameters related issue**  We identify some L1 parameters are not correctly captured or not clear if they are aligned with R1 intention. We have provide a draft document in the server to descript the details and corresponding proposed changed (“ASN.1 issue related to L1 parameters and the draft LS.zip”). For those issue which is not clear to R2, the LS is drafted to ask R1, also uploaded in the server.  The issue includes: RACH configuration for MT, SearchSpace for MT (This is also related to P6.), SSB-MTC for MT and INT-Configuration.  We would prefer to have a dedicated discussion on those L1 parameters related ASN.1 issue and how to perfectly align with R1. |
| Nokia | Firstly, comments on the proposals from Phase 1:  **Proposal 4:** **An RRC connection without a DRB is allowed.**  As mentioned above, this complicates things instead of simplifying them. We would need a lot of RRC specifications changes and we need an additional UE capability for network to know whether IAB-MT supports operation without DRB. At the same time, if an implementation does not want to use DRB for OAM then it does not have to, but a DRB can be configured and we avoid all the complications. And please remember that stage-2 text **is** a normative text.  Also, please check the count in the summary of the issue as it seems to be completely wrong.  **Proposal 5:** **The *commonSearchSpaceListIAB-r16* list to have up to 4 elements.**  Maybe we should make this a working assumption until RAN1 confirms. Or we could have an LS to RAN1 comprising all the PHY layer issues as proposed by Huawei.  **Proposal 7:** **Under the assumption that RAN3 will align the value range of the backhaul RLC channels to the one currently specified in RAN2, no changes are required in RAN2. If RAN3 maintains their current agreement of 2^14 values, RAN2 values will be updated to align with that.**  It should not be conditional to RAN3 discussions. We should request RAN3 via an LS to just update the range on their side due to RAN2 previous agreement on LCID space.  **Proposal 8:** **To confirm that for the case of EN-DC, F1-C transport over LTE is an optional feature.**  We do not have to confirm previous agreements I hope, so we can just remove this.  Other comments on RRC changes:   1. Flow control configuration:   flowControlFeedbackType-r16 ENUMERATED {perBH-RLC-Channel, perRoutingID, both} OPTIONAL, -- Need M  With current definition there is no means to de-configure flow control. We should either change the NEED code or add “none” as configuration option.   1. We agree with Huawei we should not capture IP assignment related changes yet. 2. There s a mix of IAB node, IAB-node and IAB-MT used in the specifications. We think using IAB node is OK, e.g. in field descriptions, but when we describe UE procedures we should align and utilize IAB-MT. E.g. for newly added UAC restriction, it would be better to refer to IAB-MT. 3. There are still places where BAP entity “at IAB-MT” is unnecessarily indicated:  * Section 4.4: “Configuration of BAP entity ~~at the IAB-MT [X]~~ and BH RLC channels for the support of IAB-nodes.” * bap-Config field description: “This field is used to configure the BAP entity ~~at the IAB-MT [x]. It is only used~~ for IAB nodes.” * We also agree with the comment from Huawei that defaultUL-BH-RLC-Channel-r16 and bh-RLC-ChannelID-r16 should not be the same type as logical channel ID and we support the change they proposed. |

# Summary

Based on the inputs received from companies regards the open issues regarding the IAB RRC CR, it has been agreed (in phase 1):

**Proposal 1:** **An IE to be included in the BAP configuration, to indicate if the flow control is per BH RLC channel or/and per routing ID.**

**Proposal 2:** **A clarification to be made in the field description of the default BH RLC channel IE in BAP configuration, indicating that, for the case that IAB-MT is in DC mode:**

1. **If the IAB-MT is operating in (NG)EN-DC, the default BH RLC channel is referring to an RLC channel on the SCG;**
2. **Otherwise, it is referring to an RLC channel on the MCG**

**Proposal 3:** **The FFS related to INACTIVE state to be removed.**

**Proposal 4:** **An RRC connection without a DRB is allowed.**

**Proposal 5:** **The *commonSearchSpaceListIAB-r16* list to have up to 4 elements.**

**Proposal 6:** **An LS to be sent to RAN1 informing about this decision (and possibly including other agreements that are relevant to RAN1).**

**Proposal 7:** **Under the assumption that RAN3 will align the value range of the backhaul RLC channels to the one currently specified in RAN2, no changes are required in RAN2. If RAN3 maintains their current agreement of 2^14 values, RAN2 values will be updated to align with that.**

**Proposal 8:** **To confirm that for the case of EN-DC, F1-C transport over LTE is an optional feature.**

**Proposal 9:** **In phase 2, to decide among these two for paths selection of F1-C messages in EN-DC:**

1. **Explicitly configured via RRC;**
2. **Left to network implementation.**

**Proposal 10:** **A new failure type value to be introduced for indicating that *SCGFailureInformation* is triggered due to the reception of BH RLF indication from the SN.**

**Proposal 11:** **A new failure type value to be introduced for indicating that *MCGFailureInformation* is triggered due to the reception of BH RLF indication from the MN.**

# References

1. R2-2002357, CR for 38.331 for IAB, Ericsson (Rapporteur), RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
2. R2-2002358, CR for 36.331 for IAB, Ericsson (Rapporteur), RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
3. R2-2001057, Remaining aspects of F1AP transport in EN-DC, Nokia, RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020
4. R2-2002392, CR for 38.331 for CA DC enhancements, Ericsson (Rapporteur), RAN2#109-e, Electronic Meeting, Feb 24th – March 6th 2020