3GPP TSG-RAN WG2 #109-e R2- 200xxx

**Online, February 24th– March 6th 2020**

Agenda Item: 6.1.5.2

Source: Ericsson (rapporteur)

Title: Summary of 6.1.5.2: IAB Configuration except IP address

Document for: Discussion, Decision

# 1 Introduction

This document provides a summary of tdocs (except the ones related to IP address) for agenda item 6.1.5.2 of RAN2#109-e. Specifically, the document summarizes the tdocs for the IAB-MT features list.

For other topics, i.e., RRC states for IAB-MT and parent selection at IAB node, only one company provided contribution are listed in section 2.2.

# 2 Discussion

## 2.1 Rel-16 IAB-MT Layer-2 Features list

The summary in this section has considered the documents [2-4]. The IAB-MT layer-2 features list for Rel-16 was part of the email discussion [1] and based on the feedback the rapporteur suggested companies to submit contributions for RAN2#109-e, elaborating their viewpoint. The tdocs [2-4] further discuss some of the open issues covered in the email discussion [1].

To facilitate the discussion, the topic is split into two sections:

### 2.1.1 IAB-MT capabilities

#### DRB handling

During the email discussion [108#46], one company raised that 1) RRC mandates to have at least one DRB to be able to trigger certain RRC procedures. Another company [3] argues that 2) DRB handling should be mandatory to avoid, potentially, interoperability issues and imposing a certain way of designing and implementing the OAM system.

These are two different issues in the sense that the first one implies the IAB-MT must always have a DRB configured to trigger certain procedures, which might not always be the case. The second issue is related to interoperability and flexibility to design the network.

Considering all the feedback from companies collected in [1] and the input in the contributions [3,4], it is suggested that RAN2 confirms the following two observations:

1. The IAB-DU/CU allows (but not required) configuring at least one DRB for OAM purposes (as agreed by RAN3).
2. The IAB-DU/CU configures the necessary SRBs and at least one BH RLC channel towards the IAB-MT.

If RAN2 agrees on these observations, then their implications are captured in the following proposals:

1. IAB-MT should be able to handle, at most, one DRB for OAM purposes as agreed by RAN3, and implement the DRB-related functionality in PDCP to support this.

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| Company | Comments |
| AT&T | We propose to change the wording to say “at least” instead of “at most”. The way it is currently worded, allows an IAB-MT to not support any DRBs and also prevents an IAB-MT from handling more than one DRB. |
| Huawei, Hisilicon | As also commented in the email discussion, we don’t see a need to differentiate IAB-MT with UE in terms of the supported DRB number. Moreover, there is a common understanding in RAN3 that OAM traffic may also need multiple DRBs. |
| Samsung | We also agree with changing to at least, and also to support multiple DRBs. |
| ZTE | It is suggested to change the “at most” to “at least”. As agreed in RAN3, for different types of OAM traffic, it is necessary to use different DRBs between the IAB-MT and the serving DU, and different BH RLC channels for intermediate hops with different QoS parameters. |
| vivo | We are prefer to change from ‘at most’ to ‘at least’, i.e. IAB MT can support multiple DRBs. |
| Ericsson | We acknowledge that the use of DRBs for OAM purposes is allowed (while optional) for a DU. This could imply that DRBs may need to be supported by the MT. The proposal can be also updated to include “at least”. |
| CATT | Share the same view as other companies. We also prefer to change from ‘at most’ to ‘at least’, so that the IAB MT can use multiple DRBs to handle the OAM traffic. |
| Nokia | The proposal should mention ‘at least one’ as commented by other companies. |
| Lenovo&MM | We don’t see the need to restrict the number of DRBs. We support the change from ‘at most’ to ‘at least’. |
| LG | We also think ‘at most’ should be changed to ‘at least’. |

1. For IAB-MTs, a configuration with SRB2 without BH RLC Channels, or with BH RLC channels without SRB2 is not supported. A configuration without DRB is supported.

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| Company | Comments |
| AT&T | Disagree with last sentence of Proposal 2. Suggest removing that part. Per our comment in response to Proposal 1, an IAB-MT must support DRB functionality. |
| Huawei, Hisilicon | We are also not sure this proposal is needed. We can reuse the legacy procedure in RRC as much as possible. A DRB has to be configured when executing HO/RRC-reestablishment, which is relevant with the RAN-CN procedures for HO/RRC-reestablishment. |
| Samsung | We agree with the possibility of configuration without DRB. But not understand what the first sentence exactly means/ targeting. If wanting to limit the usage of SRB2, then we think there should be no restriction on usage of SRB2, since we are anyway following legacy as much as possible until valid reason is found. |
| ZTE | In real network deployment, the donor DU/CU may not be able to support the OAM traffic delivery via IP layer. As we know, the OAM traffic delivery via IP layer requires the OAM server to perform IPv6 flow label/DSCP marking and donor CU to configure DL BH bearer mapping and routing rule for these OAM traffic by implementation. Considering this interoperability issue, it is better for the IAB-MT to always support the OAM traffic delivery via PDU session, which means the DRB functionality should be a mandatory feature. |
| vivo | We don’t understand the exact meaning of the proposal. But we think the IAB MT shall follow the legacy UE procedure with respect to SRB2 and support DRB. |
| Ericsson | Agree with the proposal.  We should not mix the following two things:   * Support of DRBs by the MT * Configuration of DRBs in the MT by the CU   This proposal is about the configuration (not the support).  For IAB nodes, it is not mandated to configure DRBs between Donor DUs and IAB nodes or between IAB nodes. It does not matter if RAN2 thinks it is better to use DRBs for OAM. This is something companies should have argued in RAN3, not in RAN2. RAN3 has concluded on that aspect and RAN2 should adapt their specs accordingly.  Since DRB configuration by the CU is optional, IABs might or might not be configured with a DRB. Thus, RRC cannot mandate to configure DRBs with no purpose. Having a BH Channel is, however, mandatory.  Note that the proposal above is not about SRB2, but the mandatory configuration of DRBs.  Companies claiming that a DRB must be configured should provide arguments to support why a DRB MUST be configured considering the agreements in RAN2/RAN3. |
| CATT | We also doubt whether this proposal is needed or not. If RAN3 already agree that DRB is optional configured, it’s unnecessary to confirm RAN3 agreement. We think to agree proposal 1 is enough. |
| Nokia | We think it would be simplest for IAB-MT to follow the legacy behavior and do not support the proposal. |
| Lenovo&MM | The proposal seems unnecessary. It is simple to follow the legacy specification. |
| LG | We also think that IAB-MT should follow legacy UE behavior as much as possible. |

#### IP assignment over RRC

Considering all the feedback collected in [1] and the suggestions in [3-4], it is proposed that RAN2 agrees on:

1. No new capability is needed for “IP assignment over RRC”. “IP assignment over RRC” is part of the feature “0. BAP layer”.

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| Company | Comments |
| AT&T | Agree with the proposal. |
| Huawei, Hisilicon | Fine with the first part. Not sure about the second part. Why is IP assignment over RRC a part of the feature “0. BAP layer”? |
| Samsung | IP assignement over RRC not belongs BAP layer. It should be a separate capability. |
| ZTE | We agree that no capability signalling is needed for IP assignment since IAB-MT has to request it. However, we are also not sure why “IP assignment over RRC” is part of the feature “0. BAP layer”. |
| vivo | Agree with Huawei and Samsung. We don’t see the relevance between RRC assigning IP and BAP layer. |
| CATT | Agree with the first part of this proposal, i.e., no new capability is needed for “IP assignment over RRC”. But we also have doubt about “IP assignment over RRC” is part of the feature “0. BAP layer”. It would be better to have a separate feature for “IP assignment over RRC”. |
| Nokia | We agree with the intention of the proposal which to our understanding is that IP assignment over RRC is mandatory for IAB-MT without capability signaling. We can think further where to capture this. We can modify the proposal accordingly, to:  IP assignment over RRC is mandatory for IAB-MT without capability signaling. |
| Lenovo&MM | We agree with the comments from Nokia. |
| LG | Agree with Huawei. |

#### F1AP over LTE leg signalling

Considering the feedback collected in [1] along with the input in [3-4], it is proposed that RAN2 collects further input to be able to decide:

1. Discuss whether “F1AP over LTE leg signaling for EN-DC IAB-MT” is a capability, and the feature/feature group in which it needs to be added.

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| Company | Comments |
| AT&T | F1AP over LTE leg signaling for EN-DC IAB-MT should be a capability. We propose to add it to 0-0 Basic EN-DC procedures feature/feature group. |
| Huawei, Hisilicon | We also think it should be optional. |
| Samsung | We think this is optional, and need a capability. And feature group is separate one with other layer based feature group. |
| ZTE | We think “F1AP over LTE leg signalling for EN-DC IAB-MT” is an optional capability. |
| vivo | Agree that it shall be a capability. |
| CATT | We also think it shall be an optional capability. |
| Nokia | Yes, this should be a separate capability carried in MR-DC container so that both MeNB and SgNB are aware of it. For 38.822, we can capture it under a new category. We cannot reuse basic EN-DC group as it is mandatory without capability signaling.  Another aspect we would like to raise that whether F1AP signaling uses LTE or NR (backhaul) path should be configurable and we need to update RRC to cover this. We raised this in [8]. |
| Lenovo&MM | Agree with an optional capability. |
| LG | It should be optional capability. |

#### Flow control

Considering all the feedback collected in [1] and the input provided in [3-4], it is proposed that RAN2 agrees on:

1. Feature “0.1 HbH flow control” has two components: BH RLC channel based and Routing ID based. These two components are separately signalled.

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| Company | Comments |
| AT&T | Agree. BH RLC channel based and Routing ID based components should be separate capabilities. |
| Huawei, Hisilicon | Agree. |
| Samsung | Agree. |
| ZTE | Agree |
| vivo | Agree. |
| CATT | Agree |
| Nokia | Agree |
| Lenovo&MM | Agree |
| LG | Agree |

#### Other capabilities

Considering the feedback collected in [1], it is proposed that RAN2 asks for further input to decide if additional capabilities are needed:

1. Discuss whether other features are missing and whether they should be placed in the feature list.

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| Company | Comments |
|  |  |

1. Agree on the features outlined in the appendix as a baseline.

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| Company | Comments |
| Ericsson | Agree (updates may be needed after all features are discussed). |
| Nokia | PDCP and RLC should be removed. |

### 2.1.2 Mandatoriness of features

### Rel-16 IAB features

Considering the feedback collected in [1], the input provided in [2,4], and the conclusions reached in the document [5], it is proposed to agree on:

1. For an IAB-MT node:   
   - The BAP layer feature group is mandatory supported with capability signalling.  
   - All other Rel-16 features are optional.

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| --- | --- |
| Company | Comments |
| Huawei, Hisilicon | We are not sure why it needs to be with capability signaling. The BAP feature group should be conditional mandatory, i.e. mandatory for all IAB-MTs. |
| Samsung | We think all Rel-16 BAP feature should be mandatory. |
| ZTE | We think BAP layer feature group should be mandatory. Whether these R16 mandatory features should be supported with capability signalling can keep align with the other Rel-16 UE mandatory features. |
| vivo | We agree that BAP layer feature group is mandatory for IAB MT, but the capability signaling is not needed. The CU knows the IAB MT has BAP capability when CU knows it is a IAB MT. |
| Ericsson | Agree with the proposal. The BAP layer feature group should be mandatory for an IAB type of device. Other features should be optional.  This proposal is aligned with the guidelines that RAN2 has agreed. |
| CATT | We think the BAP feature group should be mandatory and all other Rel-16 features are optional.  Regarding to whether the BAP feature group is mandatory or mandatory with signaling, it can be discussed further depends on the R16 UE capability guideline discussion. |
| Nokia | We agree that those features should be mandatory. It might indeed be not required to have a capability signaling for this as we have an iab-NodeIndication in RRCSetupComplete message. |
| Lenovo&MM | BAP feature should be ‘mandatory’. For the capability signaling, we can further discuss together with other UE features. |
| LG | We think that the BAP layer feature group should be mandatory without capability signaling, but others could be optional. |

### Rel-15 IAB features

Considering the feedback collected in [1] and the input provided in [3-4], it is proposed to agree/discuss the following way forward:

1. The following Rel-15 mandatory features will remain mandatory for Rel-16 IAB-MTs:  
   - Feature 0-3 “DRBs”   
   - Feature 1-0 “Basic PDCP procedures”  
   (A note might be needed to clarify the scope of the features for IAB depending on the outcome in P1).

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| --- | --- |
| Company | Comments |
| Huawei, Hisilicon | We prefer to not discuss Rel-15 capabilities; otherwise, we may need to discuss one by one if they are needed for IAB. |
| Samsung | Agree. |
| ZTE | Agree |
| vivo | Agree. |
| Ericsson | Agree on the proposal only if RAN2 confirms that DRBs are optional to be configured as already concluded in RAN3. |
| CATT | Agree. |
| Nokia | Agree. We just need to capture that minimum number of DRBs for IAB-MT is lower. This should be done in 38.306. |
| Lenovo&MM | Agree |
| LG | Agree |

1. The following Rel-15 mandatory features become optional for Rel-16 IAB-MTs:   
   - Feature 0-0 “Basic EN-DC procedures”, 2) “SCG DRB with NR PDCP”   
   - Feature 3-3 “DRX”  
   - Feature 4-5 “ANR”  
   - Feature 5 “SDAP”  
   - Feature 6 “Inactive”

|  |  |
| --- | --- |
| Company | Comments |
| AT&T | We prefer to leave Feature 4-5 “ANR” as mandatory to allow the use of ANR feature for easier/quicker topology modification and optimization. Especially when the deployed IAB network is growing or being modified, the ANR feature is very useful even for fixed IAB nodes. |
| Huawei, Hisilicon | We prefer to not discuss Rel-15 capabilities; otherwise, we may need to discuss one by one if they are needed for IAB. |
| Samsung | Agree. |
| ZTE | We think the PDCP and SDAP features should be mandatory for Rel-16 IAB-MT. |
| Ericsson | Agree on the proposal. The mandatoriness could be different for macro-type of IABs or for “pico”-type of IABs (as RAN4 has defined 2 types of IABs).  SDAP is only used for the CN QoS framework for user data. IABs do not have user plane DRBs to transmit user data, but only BH channels. So SDAP is, in this case, irrelevant.  When companies argued that an MT is similar to a UE, RAN2 did not do any evaluation of which features apply or do not apply. It cannot be taken for granted that all what is mandatory for a UE is also mandatory for an MT even if a feature is not applicable. Not discussing this does not mean that, by default MTs, will implement or support it. Indeed, it is likely to be the opposite. As HW pointed out during the email discussion, some of these features have a capability bit which could be set to zero (not supported). But this is not the way we should be doing this.  In addition, some companies argue in other email discussions that “inactive”, for instance, is not supported while they say here the opposite. |
| CATT | We think the part on inactive state may need further discussion.  In our view, before concluding on optionality of inactive mode, we shall align the understanding of the intended behaivor when an IAB node supports or not supports inactive.  We have a contribution R2-2000895 on this and we provided related comments to RRC email discussions. |
| Nokia | We agree with the proposal except for SDAP. Since we agreed at least one DRB is mandatory, SDAP needs to be mandatory as well. |
| Lenovo&MM | If at least one DRB is configured, PDCP and SDAP should be ‘mandatory’. |
| LG | Agree with Nokia |

1. All other Rel-15 L2-3 features remain as they are for Rel-16 IAB-MTs.

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| --- | --- |
| Company | Comments |
| Ericsson | Agree. |
| Nokia | Should be “as they are for Rel-16 UEs”. |

## 2.2 Other topics for agenda item 6.1.5.2

The topics listed in this section are raised by only one company, and since there is not enough input, no summary is provided.

* RRC state of IAB nodes [6].
* Parent selection at IAB nodes during initial setup [7].
* Configurability of the F1AP transmission path for EN-DC [8]

However, [6] raised some open issues related to RRC signalling for IAB-MT, which need further discussion in RAN2.

1. Topics in “2.2 other topics” require further discussion.

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| --- | --- |
| Company | Comments |
| Nokia | On [6] – we think there is no issue except for deciding whether the IAB-MT releases BAP entity when going to Inactive.  On [7] – we do not think we should further discuss optimizations to Idle mode parent selection.  For EN-DC, in case the IAB-MT supports F1AP over LTE signaling, we need to be able to tell the IAB-MT which path to use. We have a related proposal in [8] |

# 4 Discussion II

This section summarizes the previous discussion and presents a (new) set of proposals based on the received comments:

## 4.1 Rel-16 IAB-MT Layer-2 Features list

### 4.1.1 IAB-MT capabilities

### DRB handling

All companies agree that DRBs may be configured for OAM purposes, as agreed by RAN3. However, some companies understand that DRB configuration is mandatory. The rapporteur would like to remind that the support of a feature should not be mixed or confused with the configuration of a feature. Also, RAN3 agreed that DRBs are only used for OAM purposes and its configuration is optional as other means can also be used for OAM connection.

Considering all the comments, the rapporteur proposes the following:

1. Confirm that DRB configuration is optional (as agreed by RAN3).
2. IAB-MT should be able to handle DRBs.

**Do companies agree on proposal 1?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Huawei, Hisilicon** | **No** |  |
|  |  |  |

**Do companies agree on proposal 2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Huawei, Hisilicon** | **Yes, but..** | **The “should” be changed to “shall”, to reflect comments of companies.** |
|  |  |  |

Considering the output of these proposals, modifications in RRC may be straight forward since RAN2 is discussing RRC signalling in email discussion [AT109e][019][IAB].

### IP assignment over RRC

Based on the input from different companies, the new proposals are:

1. “IP assignment over RRC” is a separate feature in the feature list.
2. “IP assignment over RRC” is of mandatory support for IAB-MTs.

**Do companies agree on proposal 3?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Huawei, Hisilicon** | **Yes with comments** | **Also ok without this as a feature, as this is just a basic RRC procedure** |
|  |  |  |

**Do companies agree on proposal 4?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Huawei, Hisilicon** | **Yes** |  |
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#### **F1AP over LTE leg signalling**

Based on the opinion from different companies, the new proposal is:

1. “F1AP over LTE leg signaling for EN-DC IAB-MT” is an optional feature/capability. FFS under which feature in the feature list.

**Do companies agree on proposal 5?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Huawei, Hisilicon** | **Yes** |  |
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#### **Flow control**

Based on the input from different companies, the new proposal is:

1. Feature “0.1 HbH flow control” has two components: BH RLC channel based and Routing ID based. These two components are separately signalled.

**Do companies agree on proposal 6?**

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| **Company** | **Yes/No** | **Comments** |
| **Huawei, Hisilicon** | **Yes** |  |
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### 4.1.2 Mandatoriness of features

### Rel-16 IAB features

Based on the input from different companies, the new proposals are:

1. For an IAB-MT node:   
   - The BAP layer feature group is mandatory.  
   - IP assignment over RRC is mandatory (as per proposal 4 in phase II).  
   - All other Rel-16 features are optional.
2. Whether capability signalling is needed or not for mandatory features is FFS. Guidelines will be followed.

**Do companies agree on proposal 7?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Huawei, Hisilicon** | **Yes** |  |
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**Do companies agree on proposal 8?**

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| --- | --- | --- |
| **Company** | **Agree/Not agree** | **Comments** |
| **Huawei, Hisilicon** | **Yes** |  |
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### Rel-15 IAB features

Based on the opinion from different companies, the rapporteur proposes the following:

1. The following Rel-15 mandatory features will remain mandatory for Rel-16 IAB-MTs:  
   - Feature 0-3 “DRBs”   
   - Feature 1-0 “Basic PDCP procedures”

**Do companies agree on proposal 9?**

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| **Company** | **Yes/No** | **Comments** |
| **Huawei, Hisilicon** | **Yes** |  |
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About the support by the IAB-MT of Rel-15 features, the comments were diverse.

* 1 company wants to keep ANR.
* 1 company does not want to discuss anything about Rel-15 features. The rapporteur understands that the company wants to keep all Rel-15 as is for Rel-16.
* 1 company indicated that not supporting INACTIVE requires further discussion
* 1 company states that it is agreed that one DRB is mandatory and so SDAP should be mandatory.
* Another 3 companies also agree that SDAP should be mandatory.
* 2 companies agree on the proposal as is.

To remind, the discussion on INACTIVE mode is part of the email discussion [AT109e][019][IAB] RRC and companies are invited to provide their valuable input on this issues in [AT109e][019][IAB].

Considering this, the rapporteur proposes to agree only on those features that are not controversial:

1. The following Rel-15 mandatory features become optional for Rel-16 IAB-MTs:   
   - Feature 0-0 “Basic EN-DC procedures”, 2) “SCG DRB with NR PDCP”   
   - Feature 3-3 “DRX”  
   - Feature 5 “SDAP”
2. The optional support of the following Rel-15 features FFS:   
   - Feature 4-5 “ANR”  
   - Feature 6 “Inactive” (this may be concluded in [AT109e][019])

**Do companies agree on proposal 10?**

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| **Company** | **Yes/No** | **Comments** |
| **Huawei, HiSilicon** | **No** | **We first want to be clear about the motivation of this discussion. If the purpose is identity those mandatory features which are not useful for IAB, then we may need to look at all those mandatory features one by one. There are quite a lot of mandatory features in L1/L2/L3, and there should be a lot of others than those in Proposal 10 which are also not useful for IAB. No need to mention those L1 features which we may not understand. Even for those RAN2 related features, after quickly going through them, at least the features under “4. Measurements” and “7. Mobility” should be carefully reviewed. For example, we may need to investigate whether inter-RAT/inter-frequency HO/measurement is needed or not.**  **Furthermore, we may need to think about the specification impacts to do this work. Mandatory with capability features are now identical to optional features from signaling point of view. Not sure there is any additional value to change features of mandatory with capability to be optional, and what is the impact from specification point of view.** |
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**Do companies agree on proposal 11?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Huawei, Hisilicon** |  | **See comments above.** |
|  |  |  |

# 5 References

1. R2-2000740, Email discussion[108#46][IAB] Feature list. Ericsson
2. R2-2000819, On BAP features and their mandatory vs. optional support. Samsung Electronics GmbH
3. R2-2001061, IAB-MT features list and capabilities. Nokia, Nokia Shanghai Bell
4. R2-2000754, IAB-MT feature capabilities. Ericsson
5. R2-1916192, Work plan for Rel-16 UE Capability feature list. Intel.
6. R2-2000895 Views on RRC states of IAB nodes. CATT
7. R2-2000469 Parent selection at IAB nodes during initial setup. Intel Corporation
8. R2-2001057 Remaining aspects of F1AP transport in EN-DC Nokia, Nokia Shanghai Bell

Appendix:

Layer-2 and Layer-3 features

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Field name in TS 38.331 [2]** | **Parent IE in TS 38.331 [2]** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** | **Note** | **Mandatory/Optional** |
| 0. BAP Layer | 0.0 | Basic procedures | 1) Routing  2) Bearer mapping  3) IP assignment over RRC |  |  |  |  |  |  |  |
|  | 0.1 | HbH flow control | 1) BH RLC channel based  2) Routing ID based |  |  |  |  |  |  |  |
|  | 0.2 | RLF handling |  |  |  |  |  |  |  |  |
| 1. PDCP | 1.0 |  |  |  |  |  |  |  |  |  |
| 2. RLC | 2.0 |  |  |  |  |  |  |  |  |  |
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| 3. MAC | 3.0 | Scheduling | Pre-BSR |  |  |  |  |  |  |  |
|  | 3.1 | Bearer mapping | LCID extension |  |  |  |  |  |  |  |