3GPP TSG-RAN WG2 #114-e Tdoc R2-21xxxxx

Electronic meeting, 19th - 27th May 2021

Agenda Item: 6.1.3.5

Source: Ericsson

Title: Summary of [AT114-e][019][NR16] BAP (Ericsson)

Document for: Discussion, Decision

# Introduction

This paper addresses the following email discussion:

* [AT114-e][019][NR16] BAP (Ericsson)

Scope: Treat R2-2105357, R2-2105875, R2-2106027, R2-2106028, R2-2106218, R2-2106219

Phase 1, determine agreeable parts, Phase 2, for agreeable parts Work on CRs.

Intended outcome: Report and Agreed CRs.

Deadline: Schedule A

[R2-2105357](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105357.zip) Corrections on BAP Control PDU operations vivo CR Rel-16 38.340 16.4.0 0016 - F NR\_IAB-Core

[R2-2105875](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105875.zip) Handling of erroneous data at BAP layer Samsung Electronics GmbH CR Rel-16 38.340 16.4.0 0017 - F NR\_IAB-Core

[R2-2106027](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106027.zip) Corrections to the handling of unknown, unforeseen, and erroneous protocol data Ericsson, AT&T CR Rel-16 38.340 16.4.0 0018 - F NR\_IAB-Core

[R2-2106028](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106028.zip) Handling of Unknown and Reserved Values in the BAP Header Ericsson, AT&T discussion NR\_IAB-Core

[R2-2106218](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106218.zip) Correction on BAP handling for the hybrid release IAB deployment Huawei (Rapporteur), HiSilicon CR Rel-16 38.340 16.4.0 0019 - F NR\_IAB-Core

[R2-2106219](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106219.zip) Discussion on extension principles for mixed deployment of IAB node in different releases Huawei, HiSilicon discussion Rel-16 NR\_IAB-Core

Deadline for comments is Friday May 21 1000 UTC

# Summary of AI 6.1.3.5 - BAP

## [R2-2105357](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105357.zip) - [Corrections on BAP Control PDU operations](https://ericsson.sharepoint.com/R2-2105357.zip)

The CR includes the following change proposals:

1. Add indication of detected BH RLF recovery failure to upper layers in Section 4.3.1
2. Clarifications to the flow control feedbacks:
   1. “Construct a BAP Control PDU for flow control feedback per ingress BH RLC channel, if configured by RRC”
   2. construct a BAP Control PDU for flow control feedback per BAP routing ID as configured in downstream, if configured by RRC, in accordance with clause 6.2.3;
3. Add action for the receiving part of the IAB-MT to inform the collocated IAB-DU to construct a BAP Control PDU for BH RLF indication, in case the IAB-node has no alternative path available to IAB-donor-CU

Rapporteur´s view: Related to the change 3 above, Rapporteur observes that according to TS 38.300 (Section 9.2.7), the BH RLF indication is triggered in case the RRC reestablishment procedure fails. So it is not clear why the BAP layer of the IAB-MT should inform the collocated IAB-DU, given that the reestablishment procedure is handled at RRC layer.

* **Q1: Which of the above changes in** [**R2-2105357**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_114-e/Docs/R2-2105357.zip) **are agreeable?**

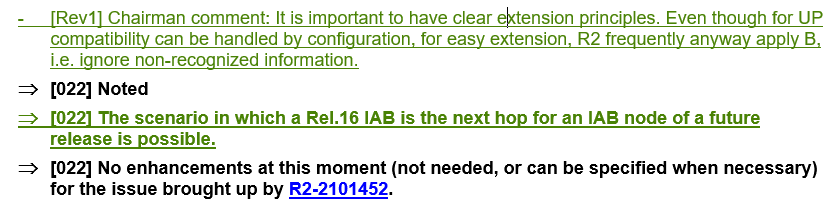
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| **Company** | **Changes (1/2/3)** | **Detailed Comments** |
| Samsung | 1 and 2 (but 2 may need rewording) | Same as Rapporteur, we are not ok with change no. 3, although we have a different understanding to the Rapporteur. We think the procedure described in this change is correct, but it is an internal matter of the IAB node and not something that should be captured in the BAP spec. |
| LG | none | For the 1st change, however, we are ok if a majority company wants to change it.  For the 2nd change, it is already clear in 38.300, i.e., “In downstream direction” and “for an ingress BH RLC channel”.  For the 3rd change, we agree with rapporteur and the 3rd change is not needed. |
| Nokia, Nokia Shanghai Bell | 1 with changes | C1: Intention is correct but the proposed wording now sounds like BAP is responsible for declaring recovery failure. We’d suggest e.g. "relaying of received indication of BH RLF recovery failure".  We think C2 is clear from Stage-2.  For C3 we agree with rapporteur. |
| vivo | 1/2/3 | Proponent.  Regarding the 3rd change, we agree with the rapporteur that the reestablishment procedure is handled at RRC layer by IAB-MT, but it is the (collocated) IAB-DU’s responsibility (instead of IAB-MT) to construct the BH RLF indication that to be transmitted to the child node(s), thus from our point of view, the collocated IAB-DU should be informed.  Also, as commented by Samsung that this in an internal matter of the IAB-node, we indeed sympathize in the same way, but it remains unclear in the BAP spec that how the BH RLF indication is propagated down to the child node(s). So we think this behavior should be explicitly indicated.  Having said that, we are also fine with adding a NOTE (rather than modify the legacy text) to capture the same intention. |
| Ericsson | 1: OK with changes  2: no strong view | Change 1: We agree with the intention, however we believe that some rewording is needed to clarify that what the BAP sublayer indicates to the upper layers is an indication of the received BH RLF indication as already specified in Section 5.4.2. We propose something similar to Nokia, e.g:  -indication of received BH RLF indication  Change 2: No strong view, but that is maybe already clear from stage-2  Change 3: We do not see the need of it. Thanks Vivo for clarifying the intention of this change, but it is not very clear from the current change in which case this information should be sent to the collocated DU. That could be misinterpreted and should be clarified, if the intention is agreed. We agree however with Samsung that is internal implementation that can be left unspecified. |
| Huawei, HiSilicon | None | 1st change is not needed. The same situation occurs in PDCP layer, while 38.323 will not captured “indication to upper layer xxx” in “4.3.1 Services provided to upper layers” (e.g. “indicate the integrity verification failure to upper layer” is supported by PDCP but not captured in 4.3.1)  3rd change is new behavior and enhancement. |
| Intel | Change 1 | Change 1: we are ok with majority views.  Change 2: we also think stage-2 is clear.  Change 3: we agree with Samsung’s view that we do not need to specify and can be left to implementation. |
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## Handling of Unknown and Reserved Values in the BAP Header

In this section the following contributions are discussed:

* [R2-2105875](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105875.zip) Handling of erroneous data at BAP layer Samsung Electronics GmbH CR Rel-16 38.340 16.4.0 0017 - F NR\_IAB-Core
* [R2-2106027](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106027.zip) Corrections to the handling of unknown, unforeseen, and erroneous protocol data Ericsson, AT&T CR Rel-16 38.340 16.4.0 0018 - F NR\_IAB-Core
* [R2-2106028](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106028.zip) Handling of Unknown and Reserved Values in the BAP Header Ericsson, AT&T discussion NR\_IAB-Core
* [R2-2106218](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106218.zip) Correction on BAP handling for the hybrid release IAB deployment Huawei (Rapporteur), HiSilicon CR Rel-16 38.340 16.4.0 0019 - F NR\_IAB-Core
* [R2-2106219](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106219.zip) Discussion on extension principles for mixed deployment of IAB node in different releases Huawei, HiSilicon discussion Rel-16 NR\_IAB-Core

Related to this topic, the following agreements were reached in RAN2#113-e:



The papers above are concerned with the fact that the current way of handling the unkown and reserved values in the BAP header might not be future-proof. In fact, according to the current BAP specification, the IAB node discards a received BAP PDU if that contains reserved or invalid values. Hence, if for example RAN2 decides in a future release to enhance the BAP header to support new features, and if a BAP PDU with such enhanced BAP header is received by any Rel.16 IAB node, such BAP PDU would be discarded, because the new BAP header will be interpreted by the Rel.16 IAB node as containing reserved or invalid values. This would obviously make the coexistence between Rel.16 IAB nodes and IAB nodes of future releases difficult.

The CRs [R2-2105875](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105875.zip), [R2-2106027](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106027.zip), [R2-2106218](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106218.zip) (and related contributions [R2-2106027](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106027.zip), [R2-2106219](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106219.zip)), propose to address this problem in Rel.16 BAP specification.

However, before discussing the Rel.16 CRs, companies are asked to provide their views on whether this issue should be fixed in Rel.16 BAP specification or not.

* **Q2: Do you believe that is beneficial to address in Rel.16 BAP specification the issue described in contributions R2-2105875, R2-2106027, R2-2106028, R2-2106218, R2-2106219?**

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| **Company** | **Yes/No** | **Detailed Comments** |
| Samsung | Yes | We are one of the proponents. We do believe the mixed-release node scenario is an important one and that we should ensure that a Rel-16 node does not discard a packet which can be routed correctly, even if its contents (apart from the routing ID) may be unintelligible to the node in question. |
| LG | Maybe | We think that there is no restriction to deploy an “old” Rel-16 IAB node as the next hop for a new Rel-17 IAB node and it could be a valid scenario. |
| Nokia, Nokia Shanghai Bell | No | We think there is nothing to fix.  The Rel-16 spec already implements this, unknown/reserved values cannot co-exist with Destination and Path fields in a BAP header:  - Only BAP Data PDU has Destination and Path fields;  - "Reserved bits shall be ignored by the receiver"  So reserved bits can be used in the future releases, legacy nodes will ignore them but not the PDU. This can be found from 6.3.5 of BAP specification (parameter description of the R bit, “Reserved bits shall be ignored by the receiver”). |
| vivo | no | As the new BAP PDU header in Rel-17 has not been determined yet, it is hard to define correct behavior of Rel-16 IAB node upon reception of a BAP PDU with Rel-17 BAP header.  The backward compatibility should be considered in the Rel-17 eIAB scope once the Rel-17 new BAP header enhancements has been well defined. |
| Ericsson | Yes | From a technical perspective, as long as the DESTINATION and PATH fields in the BAP header can be correctly decoded, there is no technical reason to require the IAB node to discard the BAP PDU, even if that contains some other unknown fields. In this case the IAB node should just act as a router and be able to select the egress link, irrespective of the content of the BAP packet.  Even though this issue can be somehow fixed by proper CU configuration in future releases, that might not be very efficient. For example, if there is the need to convey certain information in an enhanced BAP header to a new IAB node, that will not be possible if there is a Rel.16 IAB node along such path which will discard the packet. |
| AT&T | Yes | It is very reasonable to assume that Rel-16 and Rel-17+ nodes will coexist and in fact Rel-16 nodes may be closer to the donor typically since they would have been deployed earlier. As a result, it is not realistic to assume that routes can be established which avoid the issue of having BAP PDUs discarded because they contain new header content.  The current specs are not forward-compatible and it is important to fix this in Rel-16. |
| Huawei, HiSilicon | Maybe, see comment | We are fine to discuss the changes. Whether we can make change to R16 spec depends on if there is any agreeable wording. |
| Intel | Yes | We agree that the joint deployment between Rel-16 and Rel-17 IAB-node is possible. Only transfer Rel-17 packets to Rel-17 IAB-node may bring some limitation for routing. Hence, we agree that Rel-16 IAB-node need to be configured either discard or by-pass the packets per specific behavior. |
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If the answer to Q2 is **“Yes”**, companies are asked to provide their views on which CR, among the following submitted CRs, should be used as baseline:

1. [R2-2105875](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105875.zip) Handling of erroneous data at BAP layer Samsung Electronics GmbH CR Rel-16 38.340 16.4.0 0017 - F NR\_IAB-Core
2. [R2-2106027](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106027.zip) Corrections to the handling of unknown, unforeseen, and erroneous protocol data Ericsson, AT&T CR Rel-16 38.340 16.4.0 0018 - F NR\_IAB-Core
3. [R2-2106218](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106218.zip) Correction on BAP handling for the hybrid release IAB deployment Huawei (Rapporteur), HiSilicon CR Rel-16 38.340 16.4.0 0019 - F NR\_IAB-Core

Rapporteur notes that while the intention of [R2-2105875](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105875.zip) and [R2-2106027](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106027.zip) seems similar, i.e. both of them propose changes to the procedural text, the CR in [R2-2106218](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106218.zip) proposes to add two notes (based on three different assumptions described in [R2-2106219](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106219.zip)) which should explain the handling of a BAP PDU with a future release BAP header.

* **Q3: In case the answer to Q2 is “Yes”, which of the above submitted CRs should be used as baseline?**
  + **If there is the need, companies are also invited to provide their views on possible changes to those submitted CRs.**

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| **Company** | **Baseline CR** | **Detailed Comments** |
| Samsung | R2-2105875 | We prefer the approach of CRs in R2-2105875 and R2-2106027. We have concerns about the approach taken in the third CR (R2-2106218):   1. It appears to be specifying (albeit in the form of a NOTE) network behaviour: ‘BAP Data PDU… allowed to be destined to a Release 16 IAB node, only if…’ – it is better in our view to specify the node behaviour, rather than recommend (specify?) network behaviour. 2. BAP Control PDUs with invalid data are not discarded.   This second issue also holds true for the CR in R2-2106027, which not only does not discard the BAP Control PDUs with invalid data, but actually attempts to forward them. We therefore propose to go with the CR in R2-2105875.  [We would like to note that the first change in R2-2106218 (to clause 4.2.2) is valid in our view, and worth considering.] |
| LG | R2-2105875 | Given that D/C field, R bits, DESTINATION address, and PATH id fields are only included in the header of a BAP data PDU, even though an “old” Rel-16 IAB node is the next hop for a new Rel-17 IAB node, we think that BAP data PDU may have no issue with reserved/invalid value in the header if DESTINATION or PATH ID is not extended.  The IAB node would also check a reserved/invalid value in the BAP control PDU. However, we are not sure whether Ericsson and Huawei’s CR can cover the BAP control PDU properly. |
| Ericsson | [R2-2106027](file:///D:\\Documents\\3GPP\\tsg_ran\\WG2\\TSGR2_114-e\\Docs\\R2-2106027.zip" \o "D:Documents3GPPtsg_ranWG2TSGR2_114-eDocsR2-2106027.zip) | Regarding the third CR [R2-2106218](file:///D:\\Documents\\3GPP\\tsg_ran\\WG2\\TSGR2_114-e\\Docs\\R2-2106218.zip" \o "D:Documents3GPPtsg_ranWG2TSGR2_114-eDocsR2-2106218.zip), we have similar concerns as Samsung. The BAP spec is written from the perspective of the IAB node, and the IAB node does not know the release version of the next hop IAB node. Hence how the IAB node can take into account the information in the note. If that is for the CU, then there is no need to specify it in the BAP spec.  [R2-2106027](file:///D:\\Documents\\3GPP\\tsg_ran\\WG2\\TSGR2_114-e\\Docs\\R2-2106027.zip" \o "D:Documents3GPPtsg_ranWG2TSGR2_114-eDocsR2-2106027.zip) and R2-2105875 are similar. However, we note that R2-2105875 does not propose to discard the packet if that contains unknown/reserved values and this node is the final BAP destination. This is not correct, since the destination IAB node need to fully comprehend the BAP header which needs to be stripped-off before being sent to upper layers. |
| AT&T | R2-2106027 | Agree with Ericsson. The key change should focus on forwarding BAP packets if they have a valid destination/path since the intermediate node will not know if these are for a future release or are indeed invalid. The true determination of validity should be made at the destination and it is important to discard packets there if the header cannot be understood by that IAB node. |
| Huawei, HiSilicon | [R2-2106218](file:///D:\\Documents\\3GPP\\tsg_ran\\WG2\\TSGR2_114-e\\Docs\\R2-2106218.zip" \o "D:Documents3GPPtsg_ranWG2TSGR2_114-eDocsR2-2106218.zip), See comment | As to the NOTE in [R2-2106218](file:///D:\\Documents\\3GPP\\tsg_ran\\WG2\\TSGR2_114-e\\Docs\\R2-2106218.zip" \o "D:Documents3GPPtsg_ranWG2TSGR2_114-eDocsR2-2106218.zip), it is critical to ensure the change to R16 spec is valid. If CU do not follow the NOTE in the mixed release deployment, the change to R16 cannot avoid the incorrect data encoding at all.  If companies prefer not to capture the CU restriction in the normative text, maybe adding Annex (e.g. hybrid release IAB deployment) is one approach. The point is we should avoid the case that later release implementations miss this restriction, which makes the change to R16 useless.  We are fine to add discarding invalid control PDU in addition. The update wording is as blow.  When a BAP PDU that contains reserved or invalid values in BAP Control PDU or contains a BAP address which is not included in the configured BH Routing Configuration and is not the BAP address of this node is received, the BAP entity shall:  - discard the received BAP PDU.  We have concern on the others CRs with too much change to the spec and missing the restriction of CU (as in our NOTE.) |
| Intel | R2-2105875 | In general, we agree with the spirit that the reserved or invalid values and be ignored as long as the destination BAP address and path ID can be correctly decoded.  We think both R2-2105875 and R2-2106027 are fine. From specification point of view, it would be clear to discuss BAP control PDU and BAP data PDU separately. Hence, we slightly prefer R2-2105875. |
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In case the answer to Q2 is **“No”**, discussion papers [R2-2106028](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106028.zip) (see proposal P2a) and [R2-2106219](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106219.zip) (see proposal P2) also propose a possible way forward to address this issue in future releases. In particular, it is proposed that the CU should ensure in a future release that a Rel.16 IAB node can receive a BAP PDU with a Rel-16 BAP header from an IAB node of a future release.

Rapporteur would like to note that even if this approach would avoid packet discarding at the Rel.16 IAB node, it would not allow a “new” IAB node to use a new feature if that affects the BAP header, and if there is an “old” Rel.16 IAB along the routing path which will receive such BAP header. Hence, this might be a limiting factor from a configuration/deployment perspective.

* **Q4: In case the answer to Q2 is “No”, do you agree with the proposals P2a in** [**R2-2106028**](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106028.zip) **and P2 in** [**R2-2106219**](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106219.zip)**, i.e. in a future release, the CU ensures that a Rel.16 IAB node can receive a BAP PDU with a Rel-16 BAP header from an IAB node of a future release.**

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| **Company** | **Yes/No** | **Detailed Comments** |
| Nokia, Nokia Shanghai Bell | No | The specification is clear as it stands and reserved bits are already ignored by the current specification. |
| vivo | Yes for P2a in R2-2106028 | P2a in R2-2106028 solely relies on NW configuration to fix the potential issue, this solution does not require any behavioral changes on Rel-16 IAB-nodes, while P2 in [R2-2106219](file:///D:\\Documents\\3GPP\\tsg_ran\\WG2\\TSGR2_114-e\\Docs\\R2-2106219.zip" \o "D:Documents3GPPtsg_ranWG2TSGR2_114-eDocsR2-2106219.zip) requires the IAB-node be capable of generating the same BAP header format as it received.  The former solution has better backward compatibility since it has no specification impact on Rel-16 IAB-nodes.  Moreover, we think the NOTE that captures the intention of P2a in R2-2106028 should be specified in Rel-17 eIAB specification. |
| Ericsson | Yes | If no fix is done to Rel.16 spec., then the CU should ensure in a future release to avoid packet discarding, i.e. it should ensure that an IAB node of a future release uses a Rel.16 BAP header when relaying packets to a Rel.16 IAB node. Otherwise packet losses will occur whenever packets with a new BAP header are relayed to a Rel.16 IAB node. |
| AT&T | Maybe | Since this is a limiting restriction on deployments we are not 100% sure of the implications. This may be more of a recommendation/guideline rather than a requirement. |
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# Conclusion

To be updated

# References

1. [R2-2105357](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105357.zip) Corrections on BAP Control PDU operations vivo CR Rel-16 38.340 16.4.0 0016 - F NR\_IAB-Core
2. [R2-2105875](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2105875.zip) Handling of erroneous data at BAP layer Samsung Electronics GmbH CR Rel-16 38.340 16.4.0 0017 - F NR\_IAB-Core
3. [R2-2106027](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106027.zip) Corrections to the handling of unknown, unforeseen, and erroneous protocol data Ericsson, AT&T CR Rel-16 38.340 16.4.0 0018 - F NR\_IAB-Core
4. [R2-2106028](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106028.zip) Handling of Unknown and Reserved Values in the BAP Header Ericsson, AT&T discussion NR\_IAB-Core
5. [R2-2106218](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106218.zip) Correction on BAP handling for the hybrid release IAB deployment Huawei (Rapporteur), HiSilicon CR Rel-16 38.340 16.4.0 0019 - F NR\_IAB-Core
6. [R2-2106219](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_114-e\Docs\R2-2106219.zip) Discussion on extension principles for mixed deployment of IAB node in different releases Huawei, HiSilicon discussion Rel-16 NR\_IAB-Core