3GPP TSG-RAN WG3 #113-e draft R3-214233

**Aug. 16-26, 2021**

**Online**

**Agenda item: 13.2.2 (Reduction of Service Interruption)**

**Source: Samsung (moderator)**

**Title: Summary of offline discussion on CB: # 1303\_IAB\_Red\_Serv\_Inter**

**Document for: Approval**

# Introduction

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| **CB: # 1303\_IAB\_Red\_Serv\_Inter****-How to handle RRCRecponfigurations: buffering at parent node vs signalling at descendant node****-MobIKE: Is there consensus to support it? If yes, should anything be added to the specifications?****-Unnecessary DL transmission: doe sRAN3 acknowledge that the problem needs to be tackled? If yes, is there convergence on solutions?****-Any other issue?**(Samsung - moderator)Summary of offline disc in R3-214233 |

This e-mail discussion is divided into two phases:

* Phase I: View collection

Deadline: Thursday, Aug. 19th, 2021, 23:59 UTC.

* Phase II:

Deadline: Tuesday, August 24, 12:00 UTC

# For the Chairman’s Notes

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# Discussions

Since inter-donor migration is still under discussion, this CB is mainly focused on intra-donor migration defined in Rel-16.

## Service interruption reduction

To reduce the service interruption, the moderator believes that companies should have clear view on the cause of service interruption during intra-donor migration. The following figure gives Rel-16 inter-donor migration procedure. It can be observed that the service is interrupted between Step 6 and Step 12. On the other hand, the step 11 may be implemented at the early stage, e.g., after step 3, and step 12 has to be implemented after step 11. Thus, Steps 6~Step 10 can be implemented in parallel with step 11&12. In other words, the service interruption is determined by the time spent by step 6~step 10 and that by step 11&12.

To perform step 11, the IAB donor CU may need perform the configurations to each node along the target path (including migrating IAB-MT). According to Section 8.9.9 of TS38.401, 6 messages are needed to configure the BH RLC channels between two nodes; moreover, the routing table update may need additional non-UE associated procedures. Thus, it is possible that the step 11&12 may take longer period than step 6~step 10.

In summary, the service interruption time is determined by the maximum value of the time spent by step 6~step 10 and the time spent by step 11&12.



To reduce the service interruption, the following aspects are addressed in this meeting:

### Aspect 1: the service continuity during step 11

As indicated above, step 11 is a time-consuming step. To reduce the impact of such step, two solutions are mentioned in this meeting:

* + Solution 1: include default F1-U configuration in RRCReconfiguration message towards migrated IAB node and descendant nodes [6](Samsung)

This solution is similar to the default F1-C configuration, which intends to speed up F1-C traffic transmission. However, such solution may be concerned by the QoS guarantee. Contribution [6] indicates that the default BH RLC CH for F1-U can be set with the highest priority as the default F1-C configuration. Since this is for a temporary state, such default F1-U configuration with highest priority will not cause QoS degradation.

* + Solution 2: perform step 11 in advance [2](ZTE)

In order to enable concurrent TNL migration in intra-donor migration, F1-C traffic (e.g. for SCTP establishment) from descendant nodes using default BAP routing ID needs to be transmitted via migrating node before new SCTP association is established. In Rel-16, BAP routing entries are configured via F1AP message. If Rel-16 procedure is used, the F1-C traffic (e.g. for SCTP establishment) from descendant nodes may be discarded by migrating node if RRCreconfiguration buffered at parent DU(i.e. solution 1) or at child MT(i.e. solution 1) is released/executed after RACH success of migrating MT. Contribution [2] propose that BAP routing entries (at least for default BAP routing ID of descendant nodes) are configured via RRCreconfiguration message in order to solve the above issue.

##### **Q1: Please provide view on the above solutions to ensure the service continuity during step 11 (if new solution is figured out, please also list it out)**

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| Company | Solution 1 or 2 or … | Comments  |
| Samsung  | Solution 1 | We are considering a solution applicable for all scenarios, e.g., migration due to load balance, migration due to radio link degradation, etc. Solution 2 requires that the BH mapping and routing configuration should be prepared at target path in advance. This may not be applicable in the case that the migration is triggered when the radio link quality is degraded suddenly at the migrated IAB node. Moreover, in case that the migration of the boundary IAB node is failed, the preparation at the target path becomes useless at the cost of large signaling overhead at the target path and large resource reservation.  Solution 1 can be applied to any triggering case of migration. Moreover, it can avoid the unnecessary configuration and resource reservation at the target path in case of migration failure. In addition, Solution 1 can be also applicable for inter-donor migration.  |
| Qualcomm | See comment | Solution 1: There is a marginal benefit. In Rel-16, UP UL traffic requires the F1AP IAB UP Configuration Update before it succeeds. With default UP mapping, UP UL traffic can already resume before this handshake. Solution 2: Configuring BH RLC CHs b/w the migrating IAB-MT and the target parent IAB-DU requires establishing context of the migrating IAB-MT at the target parent IAB-DU. This configuration is therefore done in Step 3. Configuring BH RLC CHs and routing entries above the target parent node is part of step 11 and can be done *before* step 3 based on implementation. No specification change is needed.  |
| Nokia | Solution 2 | For Solution 1, it requires following procedures even if IAB has the default configuration.* Step A: After IPsec SA (either setup a new IPsec tunnel, or update existing IPsec tunnel via MOBIKE) and SCTP are ready, IAB-DU informs CU-CP that F1-C is ready.
* Step B: CU-CP initiates F1AP IAB UP Configuration Update procedure in case CU-UP is changed. If not changed, IAB-DU still needs to know that UL F-TEID is not changed. (or in case not changed, CP can inform IAB-DU in Step A)
* Step C: IAB-DU resumes UL F1-U

Using default configuration for F1-U may overload specific BH RLC CHs. It may unnecessary affect other IABs also share that BH RLC CH. If really needs to perform the configuration early, why not perform more UL configurations rather the default one? So solution 1 may have limited benefit.For Solution 2, the major concern seems the time to perform Step 11 when the link quality is degraded suddenly. But this may be not an issue, e.g. when CHO is used for the migrating IAB.  |
| Huawei | Solution 2 | Solution 1 is optimization with RAN2 spec impact, which is not necessary if solution can work by implementation.  |
| ZTE | Solution 2  | Firstly, we would like to clarify solution 2, what we actually want to propose is that BAP routing entries (at least for default BAP routing IDs of descendant nodes) could be delivered to migrating/descendant node via HO cmd message. In this way, TNL migration (i.e. SCTP establishment) from descendant nodes using default BAP routing ID could be performed concurrently in intra-donor migration.In solution 1, it was proposed that the RRCReconfiguration message can include default configuration for the UL F1-U traffic, e.g., default BAP routing ID, default BH RLC CH. However, UL F1-U traffic could be transmitted from migrating node only after new UL UP TNL Information including TNL address and GTP-TEID is obtained from donor CU via IAB UP CONFIGURATION UPDATE REQUEST message.  |
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### Aspect 2: RRCReconfiguration message transmission towards migrated IAB node and descendant nodes

In last RAN3 meeting, an LS was sent to RAN2 for asking advice on the following two solutions:

* + Solution 1: The RRCReconfiguration message for TNL migration of a descendent node IAB-MT is withheld by this descendant node’s parent IAB-DU, and it is delivered only when a condition is satisfied.
	+ Solution 2: The RRCReconfiguration message for TNL migration of the descendant-node IAB-MT is buffered by the descendent-node’s IAB-MT itself, and it is executed only when an indication is received from the parent IAB-DU.

Before making decision, RAN2 inputs are needed. Moreover, it can be foreseen that some F1AP signlaing is needed for Solution 1. However, this detailed discussion needs the down-scoping decision based on RAN2 input. Except this, in this meeting, companies identify some issues in RAN3 scope:

* Issue 1: Trigger condition for success case

This issue is focused on the case that the boundary/migrated IAB node successfully accesses to the target parent node. For solution 1, a triggering condition is needed to determine the release of buffered RRCReconfiguration message, while for solution 2, a trigger condition is needed to determine the transmission of the execution indication. Thus, the moderator understands that regardless of the selected solution, a common issue is the trigger condition for IAB-DU of boundary/migrated IAB node to either release the buffered RRCReconfiguration message or send an execution indication. In this meeting, the following options are given:

* + - Option 1-1: routing table for target path is updated at the migrated IAB node [2](ZTE), [7] (HW)
		- Option 1-2: success RACH of IAB-MT of the boundary/migrated IAB node [3](QC)

To reduce the service interruption, the option 1 requires that the routing table for target path is configured already before the migrated IAB node applies the new configuration, which is aligned with the Solution 2 of above Aspect 1. While Option 1-2 can be considered to be aligned with the Solution 1 of above Aspect 1, i.e., the default F1-U configuration can be used to reduce the service interruption when performing the BH and routing table configuration via Step 11.

##### **Q2: Please provide view on the above option 1-1 & Option 1-2 for the triggering condition (Please note that the intention of Q2 is to define a unified triggering condition for both solutions. So, if company feel a unified triggering condition is impossible, please also raise it up.)**

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| Company | Option 1-1 or 1-2  | Comments  |
| Samsung  | Option 1-2 | In option 1-1, the configurations of routing table for target path are performed in step 11. It means that the service is interrupted until step 11 is finished. Thus, option 1-1 is not beneficial for service interruption reduction. On the other hand, option 1-2 can be combined with the default F1-U configuration, Specifically, after success RACH to parent node, the migrated IAB node can use the default F1-U configuration for data transmission. Thus, there is no service interruption.  |
| Qualcomm | Option 1-2 | In a proper implementation, the routing table for the target path should be updated before migration of the boundary IAB-MT is even triggered. If this is the case, Option 1-1 cannot be used as a triggering condition for the boundary IAB-node to release the RRC message or send the execution indication. |
| Nokia | See comments | Option 1-1: not ok, since routing table can be updated earlier. Option 1-2: ok. But it may need to solve another issue. The RRCReconfiguration may contain the configuration for multiple candidate cells, e.g. cell#1 of Donor-DU1, cell#2 of Donor-DU2, etc. The specific configuration may be different if the IAB connect with cell#1 or cell#2. So the IAB may need to know which cell it is connected to, in order to apply a specific configuration. |
| Huawei | Option 1-1 | To address the concern from Nokia, the wording can be updated as “Option 1-1: routing table for target path is **ready** at the migrated IAB node”.if the parent node (i.e. the migrating IAB node) haven't get the updated BAP configuration which includes the entry for the child node’s default BAP routing ID, nor the updated BH RLC CH mapping configuration which includes the entry of the ingress default BH RLC CH of the child node, the UL packets for TNL migration procedure of the child node are not able to be forwarded properly, these UL packets may even be discarded by the parent IAB node since there is no matched BAP routing entry, according to the packet discarding operation for unknown date in the current BAP specification.Therefore, the parent IAB node cannot perform BAP routing for UL packets carrying child nodes’ TNL migration request with child node’s new default BAP routing ID in header, until its BAP routing table is updated accordingly by F1AP. |
| ZTE | See comments  | As stated in Q1, we propose that BAP routing entries (at least for default BAP routing IDs of descendant nodes) could be delivered to migrating/descendant node via HO cmd message. Assuming BAP routing entries is configured via HO cmd message, success RACH of IAB-MT of the boundary IAB node (option 1-2) could be used to trigger of the release of the buffered RRCreconfiguration message or sending execution indication. No matter which option is adopted, the execution of RRCreconfiguration message could be performed only after the routing table of the target path is configured at migrating node.  |
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Meanwhile, for the descendant nodes of migrated IAB node, a trigger condition is also needed to release the buffered RRCReconfiguration message or send an execution indication. Contribution [3](QC) indicates that the trigger condition can be: *the new default uplink mapping is received by the IAB-MT of the descendant node*. This condition is applicable for solution 1, which is equivalent to that the IAB-MT of the descendant node receives the RRCReconfiguration message containing new default uplink mapping. For solution 2, the trigger condition should be the reception of the execution indication from parent IAB-DU, which aims at informing the IAB-MT of the descendant node apply the buffered RRCReconfiguration. To have a unified trigger condition for both solution 1 and 2, the moderator propose the following triggering condition: the IAB-MT of descendant node performs the configurations given in RRCReconfiguration message.

##### **Q3: Please provide view on the following triggering condition at the descendant node to release the buffered RRCReconfiguration message in Solution 1 or the transmission of an execution indication in Solution 2:**

* the IAB-MT of descendant node performs the configurations given in RRCReconfiguration message

**(Please note that the intention of Q3 is to define a unified triggering condition for both solutions. So, if company feel a unified triggering condition is impossible, please also raise it up.)**

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| Company | Agree/Disagree | Comments  |
| Samsung  | Agree | In case of Solution 1, the configurations given in RRCReconfiguration is performed immediately after receiving the message. In case of Solution 2, the configurations given in RRCReconfiguration is performed immediately after receiving execution indication.  |
| Qualcomm | Disagree | Reception of own RRC message by the descendant node in Solution 1 is enough to release the RRC message of its child.Reception of execution indication by the descendant node in Solution 2 is enough to send an execution indication to the child.Why should we unify the triggering solution for both solutions if only one solution will be adopted? |
| Nokia | Disagree | Agree with QC |
| Huawei | Disagree or postpone | Somehow agree with QC. But we can discuss this after we down-select solution 1/2. |
| ZTE | See comments  | As stated in Q1, we propose that BAP routing entries (at least for default BAP routing IDs of descendant nodes) could be delivered to migrating/descendant node via HO cmd message. For solution 1, we agree that descendant node could release the buffered RRCReconfiguration message after the IAB-MT of descendant node performs the configurations given in RRCReconfiguration message. For solution 2, the execution of the buffered RRCreconfiguration message could be triggered upon reception of the indication. Agree with QC that there is no need to have a unified triggering solution for both solutions.  |
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* Issue 2: Trigger condition for failure case

During the migration procedure, the boundary/migrated IAB node may encounter failure. After the failure recovery, the triggering for solution1 and solution 2 should be determined as well. Contribution [3](QC) indicates that the trigger condition can be: *the new default uplink mapping is received by the IAB-MT of the descendant node*. Since this is not extensively discussed before, it is better to collect views from companies.

##### **Q4: Please provide view on the triggering condition at the boundary/migrated IAB node and descendant node for solution 1 and solution 2 in case that the boundary/migrated IAB node fails to access the target parent node.**

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| Company | Comments  |
| Samsung | To address this issue, we may need first figure out the following questions:* How to update the RRCReconfiguration message buffered at the parent IAB-DU for solution 1 or buffered at the IAB-MT for solution 2?

In our understanding, the new RRCReconfiguration can be updated gradually in-sequence, i.e., migrated IAB node 🡪 descendant node 1 🡪 descendant node 2, … Depending on the applied solutions for buffering RRCReconfiguration, the detailed operations may be different:* For solution 1, the new RRCReconfiguration message of migrated IAB node is firstly sent to IAB-MT of migrated IAB node. In this new message, an indication can be contained to inform delete the buffered RRCReconfiguration message at the collocated IAB-DU of migrated IAB node. Then, the collocated IAB-DU of migrated IAB node establishes TNL association with IAB donor CU and then derive the new RRCReconfiguration message for descendant node 1. After that, the IAB-DU of migrated IAB node sends the new RRCReconfiguration message to IAB-MT of descendant node 1, which contains the indication of deleting buffered RRCReconfiguration message for descendant node 2.
* For solution 2, the new RRCReconfiguration message of migrated IAB node is firstly sent to IAB-MT of migrated IAB node. In this new message, an indication can be contained to inform delete the buffered RRCReconfiguration message at the IAB-MT of migrated IAB node. After that, the IAB-DU of migrated IAB establishes TNL association with IAB donor CU and then derive the new RRCReconfiguration message for descendant node 1. After that, the IAB-DU of migrated IAB node sends the new RRCReconfiguration message to IAB-MT of descendant node 1, which contains the indication of deleting buffered RRCReconfiguration message for descendant node 2.

From the above description, additional triggering may not needed for failure case since the RRCReconfiguration message should be updated gradually. The only enhancement is to add the indication in RRCReconfiguration message to indicate the deletion of the buffered RRCReconfiguration message. In summary, our viewpoints are:* **No additional triggering condition is needed in case of migration failure**
* **An additional indication may be needed in RRCReconfiguration message, where such indication is used to indicate the deletion of buffered RRCReconfiguration in the collocated IAB-DU for solution 1, or such indication is used to indicate the replacement of buffered RRCReconfiguration in the collocated IAB-DU for solution 2.**
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| Qualcomm | For Solution 1: we disagree with Samsung. If the buffered RRC message is deleted, this may leave a PDCP SN gap. The new RRC message carrying the new indication may be discarded by the child because of the missing SN. One solution would be to deliver the buffered RRC message upon RACH failure. The child RRC message carries obsolete configuration which will be overwritten by the new RRC reconfiguration for the child during BH RLF recovery procedure.For Solution 2: the child node receives a new RRC message as part of BH RLF recovery. Receiving such message serves as trigger to discard the old RRC message stored at the child node.  |
| Nokia | This is in RAN2 scope.Agree with QC on Solution 1.  |
| Huawei | We should wait for the R2 decision and reply LS.As to the QC solution “The child RRC message carries obsolete configuration which will be overwritten by the new RRC reconfiguration”. Legacy RRC speci will execute any RRC reconfiguration immediately, without waiting for any possible new overwriting RRC reconfiguration. So, the solution still triggers child MT to perform based on the incorrect buffered RRC reconfiguration. |
| ZTE | For solution 1, donor CU could indicate migrating/descendant node to discard the buffered RRCreconfiguration message, e.g., after the migrating node’s successful recovery. And then a new RRCreconfigruation message with the same PDCP SN as the discarded RRCreconfiguration could be sent from the donor CU in order to avoid the PDCP SN gap issue. For solution 2, agree with QC that a new RRCreconfiguration message could be sent to child node, and then the child node could discard the buffered RRCreconfiguration message and apply the new RRCreconfiguration message. Neverthless, this issue is more in RAN2 scope, we could wait for RAN2’s reply on the LS.  |
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### Aspect 3: quick implementation of step 12 via MOBIKE

In response LS [1], SA3 indicates that the MOBIKE has no security issue, and can be applied to the intra-donor-CU inter-donor-DU topology adaptation. Contribution [4](Nok) proposed to change WA to the agreement, and contributions [3](QC) and [4] indicate the potential stage-2 impact. It seems that MOBIKE can be applied to Rel-17 IAB, and some stage-2 impacts are foreseen.

##### **Q5: Please provide view on the following points:**

* MOBIKE can be used to reduce service interruption during Intra-Donor-CU Inter-Donor-DU Topology Adaptation, and the following stage-2 text can be added below Step 12 of Section 8.2.3.1 of TS38.401:

In case IPsec tunnel mode is used to protect the F1 and non-F1 traffic, the IAB node may initiate the MOBIKE procedure to update the IPSec tunnel using the new outer IP address and reuse the inner IP address. After the completion of the MOBIKE procedure, the existing SCTP association and the DL FTEID can be reused. The F1-C/F1-U is migrated to target path using the new outer IP address, without the need to initiate F1/E1 procedure to update the DL F-TEID. The E1AP procedure may be initiated to resume the DL transmission.

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| Company | Agree/Disagree | Comments  |
| Samsung  | Agree  |  |
| Qualcomm | Propose rewording | “In case IPsec tunnel mode for TNL protection, the IAB-node may use MobIKE to migrate the IPsec tunnel to the new IP addresses.”The MobIKE procedure is well understood. We don’t need to explain how it works. |
| Nokia | Agree | Ok to simplify, but the text after the MOBIKE is IAB specific. Suggest following text:In case IPsec tunnel mode for TNL protection, the IAB-node may use MOBIKE to migrate the IPsec tunnel to the new IP addresses. After the completion of the MOBIKE procedure, the existing SCTP association and the DL FTEID can be reused.  |
| Huawei | Agree with rewording | “The E1AP procedure may be initiated to resume the DL transmission.”should be deleted. |
| ZTE | Agree  | Agree with QC’s rewording.  |
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## Unnecessary data transmission

Taking the following figure as an example, the IAB3 performs the migration from IAB2 to IAB5.

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During this procedure, the unnecessary data transmission needs to address two aspects:

### Aspect 1: the unnecessary DL data transmission over the source path (i.e., link between IAB donor CU and IAB node 2)

In the source path, the data sent to IAB3/4 from IAB1/2 cannot reach the destination after the migration of IAB3. Thus, the data packets from donor CU are unnecessarily transmitted over the source path after migration. In order to avoid the unnecessary data transmission at IAB1/2, some options are given in this meeting:

* + Option 1: enhance E1AP to stop the DL transmission for all affected UEs via one E1AP procedure [4] (Nok)
	+ Option 2: The ancestors of the migrating IAB node can discard the packets that are currently traversing the source path but that are not received yet at the destination by the time the HO command is issued from the network [5] (E///)
	+ Option 3: The network can prioritize the delivery of in-flight packets pertaining to IAB nodes that are about to undergo migration [5] (E///).

The moderator understands that option 1 and option 2 can be applied before the migrating IAB node receives HO command, while option 3 can be applied before issuing HO command to the migrated IAB node.

##### **Q6: Please provide view on the above three options in order to mitigate unnecessary DL packet data transmission over the source path till migrated IAB node.**

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| Company | Option 1/2/3 | Comments  |
| Samsung  | All  | All three options are applicable. Option 2 and option 3 are implementation issue. The only specification impact is from Option 1.  |
| Qualcomm | Option 1 | Option 1 is an optimization. We don’t have a problem with it.Option 2 and 3 cannot be done by implementation. They require significant signaling overhead to inform all on-path nodes that they should discard or prioritize certain packets. Option 1 is certainly a more elegant solution to achieve the same.  |
| Nokia | Option 1 | Option 2 and 3 cannot be done by implementation. In both options, how can the ancestor node know when it can discard the packet (Option 2), or prioritize the delivery (Option 3). The ancestor cannot know the HO command to the migration IAB. Also, in case CHO is used, the HO Command may be sent well before the actual HO execution. As described in [4], there is no better solution. The only possible option is to mitigate the issue, e.g. using Option 1 to stop the DL as soon as possible.  |
| Huawei | None | All solutions are considered as optimization. |
| ZTE | None  | Option 1 cannot resolve the problem completely, there may be still some packets arrive at source parent node after migrating MT has migrated to target parent node. In option 2/3, ancestor nodes need to be aware that which packets needs to be discarded or prioritized, it may introduce large specification impact.  |
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### Aspect 2: the transmission of in-flight DL packets buffered at migrated IAB node and its descendant node(s)

After the migration of boundary IAB node (e.g., IAB3), the boundary IAB node/descendant node (e.g., IAB3/4) still buffer some in-flight packets towards to different destinations. Those packets contain the BAP routing ID configured for the source path. If those in-flight packets are continuously transmitted without any change, the destination node may not receive them or discard them since the destination node is reconfigured. Thus, such continuous transmission becomes to be unnecessary, which wastes the resource. To resolve this issue, some options from last meeting are given:

* + Option 1: Ancestors of migrating IAB node can discard packets that are currently traversing the source path but not received yet at the destination

For moderator’s understanding, this option is not applicable for Aspect 2 since it is focused on the behaviors of ancestors of migrating IAB node.

* + Option 2: Network can prioritize delivery of in-flight packets pertaining to IAB nodes that are about to undergo migration

This option is questioned by [4] (Nok) since the network may not know the IABs that are about to undergo migration. It seems that contribution [4] considers that the prioritization should be based on the indication from network side (e.g., IAB donor CU). For moderator’s understanding, such prioritization should be performed by the migrated IAB node and its descendant nodes, which can create another option. Specifically, the migrated node and its descendant node(s) can prioritize the transmission of the buffered in-flight packets before receiving the RRCReconfiguration for migration.

* + Option 3: Keep source path till final packet indication is received

This option is questioned by [4](Nok) since there is no in-sequence delivery in BAP layer, and the final packet indication cannot be added by Donor-DU. In moderator’s understanding, this option aims at packets buffered at migrated IAB node and its descendant node(s). Thus, the final packet indication should be added by the migrated IAB node. In contribution [6](Samsung), this option 3 is further described as:

* The boundary/migrated IAB node and descendant nodes can keep the configurations of source path until the final packet indication is sent out
* In BAP layer, the final packet indication is set when an IAB node receives the final packet indication from its parent node and the buffered in-flight packets in its own buffer is sent out.
	+ Option 4: no enhancement [4](Nok)

Actually, the above option 2 and option 3 can be combined together to continue the DL in-flight packet transmission, which can be implemented as:

* + - *Identification of the in-flight DL packets from the source path*: the buffered packets when migrated IAB node/descendant node receives the RRCReconfiguration aiming for migration
		- *Transmission of the buffered in-flight DL packets*: the configurations before migration are used, and those in-flight DL packets can be prioritized by migrated IAB node and descendant node(s).
		- *Final packet indication addition at migrated node*: the final packet indication is added to the BAP control PDU when the buffered in-flight packets transmitted via the configuration before migration are completely sent out (i.e., RLC ACKs corresponding to all buffered packet are received for RLC AM mode, or all buffered packets are transmitted to the next-hop for RLC UM mode)
		- *Final packet indication addition at descendant node*: the final packet indication is added to the BAP control PDU when the in-flight packets transmitted via the configurations before migration (i.e., in-flight packets buffered at the descendant node and those received from parent node before receiving the final packet indication) are completely sent out
		- *Release configurations of source path*: the configurations of the source path can be released when final packet indication BAP control PDU is sent out.

##### **Q7: Please provide view on the above four options in order to continue the transmission of in-flight DL packets buffered at migrated IAB node and its descendant node**

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| Company | Option 1/2/3/4 | Comments  |
| Samsung  | Option 2&3 | Option 2 can speed up transmission of buffered in-flight packets, while option 3 can ensure the transmission of buffered in-flight packets among migrated IAB node and descendant node.  |
| Qualcomm | Option 4 | By implementation the descendant node may keep the source configuration for some time and successfully receive the inflight packets that crossed the boundary point.For Option 1: we have same understanding as Samsung that this option is not applicable for Aspect 2.For Option 2: even if the scheduling of inflight packets shall be prioritized, the descendant nodes may still be reconfigured before the inflight packets are received. Moreover, this option does not work with Solutions 1 and 2 for delivery of RRC messages to the descendant nodes over the source path (as in section 3.1).For Option 3: there is no in-sequence delivery of packets/indications in BAP layer, whether these originate at the migrating node or the donor-DU.For Option 2&3: this requires that each of option 2 and option 3 works separately.Further, option 4 does not require any specification and has all the advantages of Options 2 and 3.**We should stop spending time on features that do not provide any benefit over existing implementation-based solutions.** |
| Nokia | Option 4 | Agree with QC |
| Huawei | Option 4 |  |
| ZTE | Option 4 | Agree with QC that we could keep source path for a period of time and the timing of releasing source path is up to CU implementation.  |
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As a follow-up question, if company agree that the above option 2 and option 3 can be combined. Company can further provide views on the above implementations combining option 2 and option 3.

##### **Q8: Please provide view on the implementations combining option 2 and 3, i.e.,**

* *Identification of the in-flight DL packets from the source path*
* *Transmission of the buffered in-flight DL packets*
* *Final packet indication addition at migrated node*
* *Final packet indication addition at descendant node*
* *Release configurations of source path*

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| Company | Comments  |
| Samsung  | We agree the above descriptions on using configurations of source path to transmit buffered in-flight packets based on final packet indication.  |
| Qualcomm | Refer to Q7.**We should top spending time on features that do not provide any benefit over existing implementation-based solutions.** |
|  Nokia | No. refer to Q7 |
|  Huawei | See Q7 |
|  ZTE | No, please refer to Q7. |
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### Aspect 3: unnecessary UL transmission

In contribution [5] (E///), the unnecessary UL transmission is also addressed, and the proposed solution is same as DL, i.e.,

* **The ancestors of the migrating IAB node can discard the packets that are currently traversing the source path but that are not received yet at the destination by the time the HO command is issued from the network.**
* **The network can prioritize the delivery of in-flight packets pertaining to IAB nodes that are about to undergo migration.**

However, in moderator’s understanding, UL transmission is under discussion in RAN2 w.r.t. inter-donor-DU rerouting. One of solutions is BAP header rewriting. Thus, RAN3 can wait for RAN2 progress. In case of missing some parts, the moderator gives the following question to address UL case.

##### **Q9: Please provide view on unnecessary UL transmission in case that something is missing.**

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| Company | Comments  |
| Samsung | Wait for RAN2 progress.  |
| Qualcomm | Ancestors of the migrating IAB-node should always forward UL inflight packets to the donor!RAN3 has already agreed to support inter-donor-DU rerouting which can be used for this purpose. No other feature is necessary. |
| Nokia | There is no issue for UL, since the inter-Donor-DU rerouting can be used. |
| Huawei | Agree with Nokia |
| ZTE | In current 38.401, it was specified that in upstream direction, in-flight packets between the source parent node and the IAB-donor-CU can be delivered even after the target path is established. On the other hand, the packets which has been sent to source parent node and haven’t receive ACK and packets with source BAP routing ID which haven’t been sent to source parent node could be transmitted on target path using inter-donor -DU rerouting. So there is no need to discard the packets at ancestor nodes nor prioritize the delivery of in-flight packets.  |
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## Others

##### **Q9: Please provide view if any issue is missing in above discussion.**

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| Company | Comments  |
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# Conclusion, Recommendations [if needed]

If needed

# References

[1] [R3-213132](file:///D%3A%5C%5CWork%5C%5C3GPP%5C%5CRAN3%5C%5CRAN3%23113e%28202108%29%5C%5CInbox%5C%5CCB%20%23%201303_IAB_Red_Serv_Inter%5C%5CDocs%5C%5CR3-213132.zip) Reply LS to LS Usage of MOBIKE in IAB (SA3)

[2] [R3-213206](file:///D%3A%5C%5CWork%5C%5C3GPP%5C%5CRAN3%5C%5CRAN3%23113e%28202108%29%5C%5CInbox%5C%5CCB%20%23%201303_IAB_Red_Serv_Inter%5C%5CDocs%5C%5CR3-213206.zip) Further considerations on service interruption reduction (ZTE)

[3] [R3-213257](file:///D%3A%5C%5CWork%5C%5C3GPP%5C%5CRAN3%5C%5CRAN3%23113e%28202108%29%5C%5CInbox%5C%5CCB%20%23%201303_IAB_Red_Serv_Inter%5C%5CDocs%5C%5CR3-213257.zip) Reduction of service interruption during IAB migration (Qualcomm Incorporated)

[4] [R3-213531](file:///D%3A%5C%5CWork%5C%5C3GPP%5C%5CRAN3%5C%5CRAN3%23113e%28202108%29%5C%5CInbox%5C%5CCB%20%23%201303_IAB_Red_Serv_Inter%5C%5CDocs%5C%5CR3-213531.zip) Discussion on unnecessary UL/DL transmission during Intra-Donor Topology Adaptation (Nokia, Nokia Shanghai Bell)

[5] [R3-213600](file:///D%3A%5C%5CWork%5C%5C3GPP%5C%5CRAN3%5C%5CRAN3%23113e%28202108%29%5C%5CInbox%5C%5CCB%20%23%201303_IAB_Red_Serv_Inter%5C%5CDocs%5C%5CR3-213600.zip) Mitigation of Unnecessary DL and UL Transmissions During Intra-Donor Topology Adaptation (Ericsson)

[6] [R3-213699](file:///D%3A%5C%5CWork%5C%5C3GPP%5C%5CRAN3%5C%5CRAN3%23113e%28202108%29%5C%5CInbox%5C%5CCB%20%23%201303_IAB_Red_Serv_Inter%5C%5CDocs%5C%5CR3-213699.zip) Discussion on Service Interruption Reduction for Rel-17 IAB (Samsung)

[7] [R3-213933](file:///D%3A%5C%5CWork%5C%5C3GPP%5C%5CRAN3%5C%5CRAN3%23113e%28202108%29%5C%5CInbox%5C%5CCB%20%23%201303_IAB_Red_Serv_Inter%5C%5CDocs%5C%5CR3-213933.zip) Reduction of Service Interruption for IAB topology update (Huawei)