3GPP TSG-RAN WG3 #113-e R3-21xxxx

Online, January 25 – February 5, 2021

Agenda Item: 13.2.1

Source: Qualcomm (moderator)

Title: CB#34 IAB\_MigrationProcedureDetails

Document for: Discussion

# Introduction

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| **CB: # 34\_IAB\_MigrationProcedureDetails**  **QC**  **Include the TP for inter-donor IAB-node migration procedures using Xn handover into BL CR to TS 38.401.**  **NR-DC to be baseline for simultaneous inter-donor connectivity for the support of load balancing, robustness and reduction of service interruption.**  **RRC Reestablishment procedure is baseline for inter-donor BH RLF recovery.**  **discuss intra-donor CHO until further progress has been made with inter-donor IAB-node migration using Xn handover procedure.**  **Intel**  **Due to the increased complexity of a dual logical IAB-DU or dual IAB-DU solution, continue to discuss solution based on opt1 and opt2 that does not require two logical IAB-DU or dual IAB-DU at the migrating node, where:**  **Opt1: Migrate the migrating IAB node first, then its descendent.**  **Opt2: Migrate the migrating IAB node’s descendent first, then the IAB node itself.**  **Use the full migration top-down sequence approach (baseline solution) for inter-CU RLF recovery.**  **KDDI**  **The data forwarding route from the source IAB-donor to the source IAB-DU via the connection between the target IAB-donor and the target IAB-DU should be studied.**  **with top-down sequence, after IAB-MT migration, the source IAB-DU uses new BAP addresses configured to IAB-MT for its BAP routing.**  **after IAB-MT migration, migrating IAB node has two types of IP addresses, one for source IAB DU and the other for target IAB DU.**  **IP address to BAP address mapping mechanism should be considered while UE’s packet is forwarded by the target IAB-donor and the target IAB-DU.**  **Fuj**  **In migration procedure for BH RLF recovery, the old F1-C should be redirected to the new donor DU after the IAB-MT re-establishes to the new donor in the same way as intra-donor RLF recovery.**  **To reduce the service interruption, the new donor can update the BAP routing, BH RLC channel for F1-U as well as the TNL address for F1-U when the IAB-MT re-establishes to new donor through RRC message.**  **For inter-donor RLF recovery, RAN3 should support two options for new F1-C setup.**  **- In top-down sequence of full migration, the new F1-C should be set up just after the IAB-MT re-establishes to the new donor.**  **- In top-down sequence of gradual migration, new F1-C can be set up a while after the IAB-MT re-establishes to the new donor. The IAB-DU should buffer the handover command messages for UEs/child nodes until the new F1-C as well as the context of UEs/child nodes are set up.**  **To reduce the service interruption, the updated BAP routing and BH RLC channel for F1-U as well as the updated TNL address for F1-U can be contained in the handover command for IAB-MT.**  **In top-down sequences of full or gradual inter-donor handover, the old F1-C with source donor should be redirected to the target donor DU after the IAB-MT completes handover.**  **In top-down sequence of full migration, the new F1-C association can be set up before or immediately after IAB-MT migration. The IAB-node can switch to the operation of new DU as soon as the handover of IAB-MT when the new F1-C has been set up.**  **In top-down sequence of gradual migration, new F1-C can be set up a while after the IAB-MT migrates to the new donor.**  **In bottom-up sequence, the old F1-C with source donor needs not be redirected to the target donor DU when the IAB-MT performs handover.**  **In bottom-up sequence, the new F1-C association should be set up before IAB-MT performs handover and redirected to the target donor DU after the IAB-MT completes handover.**  **In nested sequence, the old F1-C with source donor needs not be redirected to the target donor DU after the IAB-MT completes handover.**  **In nested sequence, the new F1-C should be set up before IAB-MT hands over to target donor and redirected to the target donor DU after IAB-MT completes handover.**  **In nested sequence, the IAB-DU should buffer the handover complete message(s) of the UEs/child nodes until the IAB-MT accesses to the target cell.**  **HW**  **support the simple IAB node migration case that only the top-level IAB-MT migrates to the target donor while all the descendent nodes still connect the source donor CU via the new path of the top-level IAB-MT.**  **For the case that the “final” stage is all the IAB-node and UEs connect new IAB-donor-CU, narrow down the possible procedure combination as the following three: full-nested, gradual based top-down, and gradual based bottom-up procedures for inter-donor migration.**  **If all the three possible inter-donor migration procedure combination are allowed, which one is used should be left to donor-CU’s implementation.**  **discuss how to support the migration procedure for simultaneous connected IAB-MT, after there are some conclusions on non-DC based migration.**  **CATT**  **Topology information of migrating IAB node in source CU is included in Xn handover request message to target CU.**  **Target CU indicates source CU to release F1 connection between source CU and migrating IAB node.**  **The above procedure is considered as baseline for inter IAB donor-CU topology adaptation**  **No need to restrict the timing of F1 setup procedure for IAB node.**  **Source donor also needs to know backhaul and topology-related information in target CU**  **Topology-related information exchanges between two donors including BAP addresses at least.**  **consider which CU send RRC reconfiguration message to descendant nodes and UE.**  **support both top-down and bottom-up migration of descendant nodes.**  **ZTE**  **Source donor CU could obtain re-configured DU cell ID from target donor CU or IAB-DU.**  **Downlink F1-C packets between source donor CU and IAB-DU could be delivered via target donor CU or via target donor DU without passing through target donor CU.**  **Uplink/Down F1-U packets between source donor CU and IAB-DU could be delivered via target donor DU without passing through target donor CU.**  **Assuming uplink F1-U packets between source donor CU and IAB-DU are delivered via target donor DU, it should be discussed how could packets with source BAP routing ID be delivered via target path and how to avoid packets with source IP address allocated by source donor be discarded by target donor DU or routers.**  **If downlink F1-C or F1-U packets between source donor CU and IAB-DU are delivered via target donor DU, it should be discussed how to set and obtain the target IP address of these packets and how to configure downlink traffic mapping at target donor DU.**  **In gradual migration, IAB-DU transmit updated configurations to UEs via system information modification procedure. In this way, IAB-DU could switch DU cells in the next modification period after receiving the updated configurations from target donor CU.**  **Uplink F1-C packets between target donor CU and IAB-DU could be delivered via source donor CU or via source donor DU without passing through source donor CU.**  **Uplink/Down F1-U packets between target donor CU and IAB-DU could be delivered via source donor DU without passing through source donor CU.**  **Assuming uplink F1-C/F1-U packets between target donor CU and IAB-DU are delivered via source donor DU, it should be discussed how could packets with target BAP routing ID be delivered via source path and how to avoid packets with target IP address allocated by target donor be discarded by source donor DU or routers.**  **If downlink F1-U packets between target donor CU and IAB-DU are delivered via source donor DU, it should be discussed how to set and obtain the target IP address of these packets and how to configure downlink traffic mapping at source donor DU.**  **For nested full migration, IAB-DU maintain only one F1-C connection with source or target donor CU, i.e. IAB-DU establish F1 connection with target donor CU after releasing F1 connection with source donor CU.**  **For nested full migration, source cell ID rather than the target cell together with an indicator that the target cell may not yet be available or serving cell is not changed could be included in the XnAP handover request message.**  **CHO is supported for the migrating IAB node and descendant IAB nodes.**  **For inter-donor-DU migration, the descendant IAB nodes need to be configured with default UL-BAP-RoutingID, default UL-BH-RLC-channel, and new IP address which is included in CHO configuration from donor-CU.**  **“DAPS-like” solution should also be applied to descendant nodes and UE during inter-CU migration in IAB.**  **SS**  **discussion of the inter-donor migration should focus on the scenario where the IAB-MT of the migrated IAB node has single connectivity capability only.**  **multi-MT solution is not considered for inter-donor migration.**  **the gradual migration opt1, i.e., IAB-MT migration first and then F1-U migration, is selected as the migration sequence.**  **migration is performed as the following sequence:**  **- IAB-MT of the migrated IAB node performs the migration first.**  **- The descendant IAB-MTs executes the migration from top to bottom**  **- The UE executes the migration after the migration of its accessing IAB node**  **- For IAB-MT/descendant IAB-MTs/UEs, the RRCReconfiguration message is sent by the source donor CU, while the RRCReconfigurationComplete message sent to the target donor CU, where**  **- For IAB-MT, RRCReconfiguration message via source path, while RRCReconfigurationComplete message via target path**  **- For descendant IAB-MTs, RRCReconfiguration message via source path or target path depending on whether IAB-MT of migrated IAB node finishes migration or not when sending it, while RRCReconfigurationComplete message via target path**  **- For UEs, both RRCReconfiguration and RRCReconfigurationComplete messages via target path**  **default BAP configuration (i.e., default BH RLC CH and BAP routing ID) can be configured to the IAB-MT via HO command.**  **IAB-DU configurations of migrated IAB node can be partially updated via OAM or target donor CU, where PCI/DL frequency of the in-use cells should be kept, and the F1 SETUP REQUEST message can indicate the cell status information (e.g., in-service, out-of-service).**  **the concept of separate logical IAB-Dus in the same physical node is a pure implementation issue.**  **target IAB donor CU triggers the UE context migration after IAB-MT part accesses to the target IAB donor CU and the F1 interface has been established with the target IAB donor CU.**  **the existing HANDOVER REQUEST/RESPONSE message is used for the UE context migration with some additional enhancements on IAB, e.g., ignoring target Cell ID, adding gNB-DU F1AP UE ID, etc.**  **source IAB donor CU can indicate the end of the UE context migration.**  **above procedure is the start point for inter-CU IAB node migration.**  **Nok**  **deprioritize the solution that using HO procedure to move UE context to target Donor, when the IAB only have one gNB-DU.**  **consult RAN1/2/4 on the feasibility of dual-DU in an IAB node, before discussing the solution using 2 gNB-DUs in one IAB node.**  **adopt the solution where UE context remains in source Donor as a starting point for Inter-Donor Topology Adaptation.**  **when IAB-MT is simultaneously connected to 2 donors, the UE context and F1-C can remain in the original Donor, when there is a failure of the MCG link or SCG link.**  **Gg**  **discuss the migration sequence and the enhancement needed for the migrating IAB-node and the descendant UE(s)**  **discuss indirect F1 interface via the source or target IAB-donor during the gradual inter-donor migration**  **discuss data forwarding part to reduce service interruption during the inter-donor migration.**  **E///**  **For inter-donor load balancing scenarios involving IAB-MTs capable of simultaneous connectivity to two donors, partial traffic offloading between donors is applied, where the IAB/UE contexts are not transferred to the target CU, i.e., they remain in the source CU.**  **For inter-donor RLF recovery scenarios involving IAB-MTs capable of simultaneous connectivity to two donors, partial traffic offloading between donors is applied, where the IAB/UE contexts are not transferred to the target CU i.e. they remain in the source CU.**  **\*\*\*\*\***  **- Prioritize intra-donor over inter-donor?**  **- Opt1 (Migrate the migrating IAB node first, then its descendant) vs. Opt2 (Migrate the migrating IAB node’s descendant first, then the IAB node itself) – if a selection is not possible: specify both? Leave order to implementation?**  **- Maintain contexts in the source donor?**  **- Whether/how to capture the case with 2 simultaneous donors?**  **- Whether/how to capture the case with 2 DUs in the same IAB node? Implementation, i.e. no need to specify?**  **- align discussion with CB 35 (related topic)**  **- attempt st2 TP**  (QC - moderator)  Summary of offline disc [R3-211001](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Inbox\R3-211001.zip) |

This CB#34 discussion has two phases:

**Phase 1: Agree on general principles.**

**Phase 2: TBD**

The deadline for Phase 1 is Thursday, January 28, 23:59:59 UTC. This allows the moderator to prepare some proposals on Friday for Monday’s online session.

The deadline for Phase 2 is the same as for all email discussions, i.e., Tuesday, February 2, 12:00:00 UTC.

# For the Chairman’s Notes

Propose the following:

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# PHASE 1: Discussion

## 3.1 Initial Remarks

This CB34 focuses on inter-IAB-donor migration procedures. Enhancements to intra-IAB-donor migration will be handled in CB36. Details to CHO and DAPS will be handled in CB35. This CB34 will further try to align aspect related to inter-donor transport with CB37 on inter-donor redundancy since there are a lot of commonalities.

## 3.2 Baseline procedures

The Chairman Notes from the RAN3#110e state:

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| **For IAB nodes connected to a single donor, IAB-MT migration between IAB-donors can support robustness and load balancing; the Xn handover preparation procedure is taken as baseline**.  **For IAB nodes connected to 2 donors, robustness and load balancing can be supported by using simultaneous connectivity**  **Chair: evaluation of multiple solutions is expected; WA on WF is also expected at e.g. next meeting**  **For inter-donor RLF recovery using e.g. RRC Reestablishment, only full migration using the top-down sequence should be considered.**  **Study the solution for the baseline RLF scenario, where IAB node experiencing RLF can connect only to 1 donor at a time.** |

The Chairman Notes from the RAN3#109e state:

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| **Multi-MT Support is FFS in RAN3 pending RAN2** |

### 3.2.1 Simultaneous connectivity to two donors

For simultaneous connectivity to two IAB-donors, the chair recommends evaluating multiple solutions with a WA on a WF in this meeting.

Contributions R3-210347, R3-210216 and R3-210721 consider load balancing and robustness as the use cases for simultaneous connectivity to two IAB-donors. We also include reduction of service interruption in this context, while assuming that details of this use case are handled in CB36.

We need to perform some clarification on the use cases:

* **Load balancing**: Some F1-U traffic can be routed via the source path while other F1-U traffic is routed via the target path. The granularity is discussed further below.
* **Robustness**:It is assumed that robustness is achieved by using the IAB-MT’s second link as backup for UP and CP, e.g., in case the first link fails.
* **Reduction of service interruption**: It is assumed that the migration of F1-U from one parent link to the other parent link can be done with lower service interruption compared to migration of a single connected IAB-MT migration using Xn handover.

To support these use cases, the following candidate procedures are considered as baselines:

* **NR-DC:** This procedure already used for Rel-16 intra-donor topology adaptation.
* **DAPS:** This procedure builds on Xn handover. Extensions are necessary to support simultaneous connectivity for BH RLC channels.

Based on RAN3 agreement, Multi-MT will be considered pending on RAN2. RAN2 has not yet agreed to support efforts on multi-MT.

***Q1: Please select which of NR-DC and/or DAPS should be used as baseline procedure for the IAB-MT’s simultaneous connectivity between IAB-donors. Please specify which use case(s) the candidate procedure should support.***

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| **Company** | **Comments** |
| **Qualcomm** | **NRDC should be supported for all use cases. This is necessary to have consistency with Rel-16 intra-donor redundancy.**  **DAPS may be considered. Since the release of the source path is triggered by the target donor, it could also be used for all use cases.** |
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### 3.2.2 Single connectivity to two donors

For a single-connected IAB-MT, we already agreed to use the Xn handover procedure as the baseline for IAB-MT migration. IAB-MT migration via Xn handover can provide some degree of load balancing between IAB topologies.

For robustness, RRC Reestablishment and CHO can be considered as baseline procedures. CHO builds on Xn handover and its applicability to IAB is discussed in CB 35.

The RRC Reestablishment procedure is already used in Rel-16 for intra-donor RLF-recovery. It can be used as the baseline for inter-donor RLF recovery of a single-connected IAB-node.

***Q2: Do you agree that RRC Reestablishment procedure is baseline for inter-donor RLF recovery of a single-connected IAB-node. If not, please provide an alternative solution for IAB-nodes that do not support simultaneous connectivity to two donors.***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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## 3.3 IAB-MT migration via Xn handover

### 3.3.1 Sequences considered

In the last meeting, we discussed *top-down*, *bottom-up* and *nested* sequences for IAB-MT migration. Prior to this meeting, the moderator proposed the following definitions:

* Bottom-up: RRC Reconfiguration and RRC Complete MSGs are delivered via source path.
* Top-down: RRC Reconfiguration and RRC Complete MSGs are delivered via target path.
* Nested: RRC Reconfiguration is delivered via source path and RRC Complete via target path.

We further differentiated between gradual vs. full migration procedures:

* Gradual procedures also support full migration (as the chairman pointed out in last meeting).
* Full-only migration procedures may exist that use less (new) signaling than gradual procedures

Preferences by contributions:

R3-210347 proposes to start with top-down and bottom-up gradual procedures. The nested procedure should be discussed for intra-donor migration first. Optimizations for full migrations can be handled later.

R3-210429 only considers the top-down sequence.

R3-210389 discuss top-down and bottom-up sequences for full and gradual procedures. They believe the full procedure is better for fast migration in case of pending handover.

R3-210458 and R3-210207 consider top down and bottom up sequences as well as full and gradual migration.

R3-210547 and R3-210487 believe that preference should be given to the first step of the top-down sequence, where only the IAB-MT migrates while IAB-DUs and UEs underneath remain at the initial donor.

R3-210100 proposes that RAN3 study both top-down and bottom up sequences.

R3-210216 is unhappy with the above definition but describe procedures that align with top-down and nested sequences for a gradual migration procedure. Full migration is considered not feasible

R3-210541 discusses top-down and bottom-up for the gradual migration only.

The moderator proposes to start with the gradual procedure with the focus on top-down sequence. This procedure allows termination after the IAB-MT migration in case it is not desirable to migrate UEs and IAB-DUs to the target IAB-donor. It can also be extended to a full migration if desirable.

The moderator tries to extract all aspects from the above contributions that address this procedure. It appears that the gradual migration can be broken down into atomic procedures, which can be applied to either top-down or bottom up sequence. The moderator does not see a reason yet to deprioritize any of these two sequences.

The nested sequence only applies to full migration, and it appears promising in reducing interruption time over the top-down or bottom up sequence. The moderator believes that the nested sequence should first be studied for intra-donor migration in CB 36.

### 3.3.2 Gradual migration

The gradual migration can be broken down into the following atomic sub-procedures, which are:

**1. Inter-donor migration of the top-level IAB-MT**,whichincludes the Xn handover of the top-level IAB-MT between two parent nodes and the migration of F1 transport of the collocated IAB-DU and all descendent IAB-DUs to the target path. Figure 1 shows an example for the top-down sequence.

**2. Inter-donor migration of an individual IAB-DU,** where the IAB-DU migration includes the establishment of the IAB-DU’s F1-C to the target donor and the migration of the UEs’ and child-MTs’ context to the target donor. Figure 2 shows an example for the top-down sequence.

The bottom-up sequence uses the same principal atomic procedures, just in a different order. There may be some differences in the details of these atomic procedures for top-down and bottom-up procedures, which are FFS.



**Figure 1: Migration of top-level IAB-MT**



**Figure 2: Consecutive inter-donor migration of individual IAB-DUs together with its respective UE(s) and/or child MT(s)**

The following proposal aims to capture the minimum steps that need to be supported for a gradual migration, or for a migration that keeps all F1 transport on the source donor. Note that this propose does not preclude optimizations, e.g., for a full-only migration.

***Proposal: The procedure for inter-donor migration of a top-level IAB-MT supports:***

* ***Xn handover of the top-level IAB-MT between two parent nodes connected to different IAB-donors, and***
* ***the migration of F1 transport to the target path for the collocated and all descendent IAB-DUs.***

***Q3.1: Do you agree with this proposal: Y/N***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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The next proposal aims to capture IAB-DU migration as on optional enhancement. It supports both top-down and bottom-up sequences.

***Proposal: The inter-donor migration of the top-level IAB-MT may be followed (“top down”) or preceded (“bottom up”) by the inter-donor migration of the collocated IAB-DU and/or one or multiple descendent IAB-DUs, where the inter-donor migration of each IAB-DU includes:***

* ***the establishment of an F1-C association to the target donor, and***
* ***the context migration of the IAB-DU’s UEs and child IAB-MTs to the target CU.***

***Q3.2: Do you agree with this proposal: Y/N***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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[R3-210547](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210547.zip) believes that IAB-DU migration should be left up to IAB-donor implementation. This contribution also believes that the use of top-down or bottom-up sequences, if they both are supported, should be left up to donor implementation.

***Proposal: It is up to the source donor implementation if and when inter-donor migrations of IAB-DUs are conducted. The order of such inter-donor IAB-DU migration is FFS.***

***Q3:3 Do you agree with this proposal: Y/N***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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### 3.3.3 IP addresses:

Some issues were raised on IP transport across the two topologies. R3-210429 emphasizes that the IAB-node should have a separate IP address for transport by the target-DU. According to R3-210207, packet discard due to filtering should be considered when traffic is sent along the target path. According to this contributions, RAN3 should also discuss mechanisms to obtain the target-path IP address(es) and default mappings.

The moderator believes that all UL and DL traffic sent via the target path needs to use an IP address that is anchored at the target-path IAB-donor-DU. This applies to F1 traffic exchange with source CU and target CU. Since UL traffic uses IP addresses from the target-path IAB-donor-DU, packet filtering will not lead to packet discard.

***Proposal: All traffic exchange via the target path needs to use IP addresses that are anchored on an IAB-donor-DU on the target path.***

***Q4.1: Do you agree with this proposal?***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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***Proposal: The IAB-MT’s Xn handover may include information for the migration of F1 transport to the target path such as IP addresses and/or default mappings.***

***Q4.2: Do you agree with this proposal?***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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R3-210216 proposes that allocation of IP address and default BAP configuration for the migrating IAB-MT can be included in the Xn HO Request/Request ACK handshake. Let’s focus on IP address allocation first.

***Proposal: For the migrating IAB-MT, the following CU-controlled IP address allocation mechanism can be considered:***

* ***Source donor includes IP request in Xn HO request to target donor.***
* ***Target donor obtains IP address(es) from the target IAB-donor-DU via F1AP***
* ***Target donor passes IP address(es) in HO command via MT HO Request Ack to the IAB-MT.***

***Q4.3: Do you agree with this proposal: Y/N***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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### 3.3.4 Commonality of all inter-donor migration mechanisms

Some contributions, e.g., R3-210429, R3-210458, R3-210100 and R3-210207 discuss aspects related to BAP routing via the target path. R3-210347 claims that transport via the target path is the same as discussed for inter-donor redundancy. This would allow using one common inter-topology transport mechanism for inter-donor MT-migration and inter-donor redundancy.

***Proposal: One common inter-topology transport mechanism should be defined for gradual inter-donor MT migration and inter-donor redundancy.***

***Q5.1: Do you agree with this proposal: Y/N***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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In this case this prior proposal finds approval, the same information exchange could be used to facilitate F1 migration to the target path for inter-donor MT-migration and inter-donor redundancy.

***Proposal: The same information exchange should be used to migrate transport to the target path for inter-donor IAB-MT migration and inter-donor redundancy.***

***Q5.2: Do you agree with this proposal: Y/N***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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The moderator believes that we should converge on these two proposals. This may allow us to leverage the solutions developed in CB37 on inter-donor redundancy.

R3-210100 proposes that topology information is included in the IAB-MT’s HO Request message. The moderator believes that the principal question if donor 2 has to know about donor-1’s topology (and/or vice versa) should also be handled by CB 37 for inter-donor redundancy.

### 3.3.5 IAB-DU migration

The following questions have been raised on IAB-DU migration (see Figure 2):

1. How the IAB-DU migration is triggered, and how the source donor know that the IAB-DU has successfully established its F1-C association with the target IAB-donor so that it can start migrating UEs and child MTs.
2. How the source CU knows the target cell IDs (CGI) it needs to include in the UE HO Request.

The following options solution have been proposed:

**Option 1 (R3-210347, R3210216):**

* The source donor sends a message to the IAB-node to trigger migration of the IAB-DU. When F1-C has been established, the target donor sends a trigger request to the source donor for the context transfer of UEs and child IAB-MTs.
* The IAB-DU uses F1 SETUP procedure with the target donor, and it includes the source cell IDs in the F1 SETUP REQ. The target donor returns the target cell IDs to the IAB-DU and caches the mapping between source and target cell IDs. The source donor includes the source cell IDs in the UE HO Request, which the target donor can map to the target cell Ids.

**Option 2 (R3-210207):**

* The F1-C establishment to the target-donor occurs via the source-donor, where the source-donor assumes target-donor proxy role to the IAB-DU and IAB-DU proxy role to the target donor. The F1-C establishment can be triggered by the source IAB-donor. It allows the source donor to have full knowledge of the IAB-DU’s new configuration.

***Q 6.1: Which option do you prefer for the triggering of IAB-DU migration? Do you propose an alternative?***

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| **Company** | **Option** | **Comments** |
| **Qualcomm** | **See comment** | **Option 1 is straightforward but requires a lot of signaling.**  **Option 2 seems rather elegant. However, the source donor should stay in the path only for limited amount of time.**  **Further discussion may be necessary.** |
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During inter-donor migration of the IAB-DU, the RRC Reconfiguration message to the UE (or child-MT) is sent by the source IAB-donor, while the RRC Reconfiguration message is sent by the UE to the target IAB-donor. Several contributions believe that because of this, the F1AP association to the target donor needs to be established while the F1AP association with the source donor still exists (i.e. both “logical” IAB-DUs have to be simultaneously supported).

***Proposal: For inter-donor migration of the IAB-DU, the F1AP association to the target donor needs to be established while the F1AP association with the source donor still exists so that the RRC Reconfiguration messages to UEs and child-MTs can be delivered by the source IAB-donor while the RRC Reconfiguration messages can be delivered to the target IAB-donor.***

***Q6.2: Do you agree with this proposal? If not, please explain why.***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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### 3.3.6 Cell IDs

The chairman note contains the following observation:

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| **Common understanding that when the IAB-DU migrates to the new IAB-donor, the NCI of the IAB-DU’s cell reflect the identifiers of the new donor** |

R3-210216 and R3-210487 raised the question if frequency and/or PCI can change during inter-done IAB-DU migration, how it can be reconfigured, and if RAN1, 2, and 4 should get involved.

***Q7.1: Do we assume that frequency and PCI can change during the IAB-DU migration? Should RAN1, 2, 4 be involved in this case?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **No** | **Baseline is that PCI and frequency won’t change. Change of PCI frequency should be discussed separately.**  **For this reason, RAN1, 2 and 4 and not affected.** |
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***Q7.2: Should RAN1, 2, and 4 be involved if only NCI changes?***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **No** | Since UEs (and child MTs) do not execute the resyn at the same time, the IAB-DU essentially supports both NCIs for some time frame. This situation is similar to a RAN sharing scenario, where multiple PLMNs use separate CGIs but same radio resources (i.e. frequency and PCI). Since this RAN sharing scenario is already supported, RAN1, 2 and 4 would not have to be engaged for simultaneous support of two NCIs during inter-donor IAB-DU migration. |
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Cell IDs are usually configured via OAM. R3-210216 was wondering how NCI reconfiguration can be accomplished for inter-donor IAB-DU migration.

**The following options are considered for the reconfiguration of NCI [and potentially also for PCI and frequency]:**

* **Option 1:** Reconfiguration is conducted by the target CU.
* **Option 2:** Reconfiguration is based on implementation, e.g., by using OAM-configured mapping table to F1AP CU IDs or NCI prefix broadcast in SIB1.

***Q 7.3: Which of these options to you prefer? Any alternative?***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Option 1** | **Option 2 requires too much reconfiguration when deployment changes.We can retain OAM-based NCI configuration during DU integration and allow the CU to overwrite the NIC.** |
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## 3.4 Simultaneous IAB-MT connectivity

R3-210721 proposes that load balancing using simultaneous inter-donor connectivity should be supported with F1-U granularity, where any subset of F1-U connections can be routed via one of the IAB-MT’s parent links while the complement subset of F1-U connections is routed via the other parent link.

***Q8.1: Do you agree that for an MT with simultaneous connectivity to two IAB-donors, load balancing should be allowed with F1-U granularity? If not, please provide reasons and define granularity that should be supported.***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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R3-210721 proposes that for load balancing using simultaneous inter-donor connectivity, it should be possible to keep all UE and descendent nodes at the IAB-donor associated with the IAB-MT’s first parent while routing (some or all of) their F1-U connections via the IAB-MT’s second parent.

***Q8.2: Do you agree that for an MT with simultaneous connectivity to two IAB-donors, it should be possible to keep all UEs and descendent nodes at donor 1 while routing their F1-U connections via the IAB-MT’s link with donor 2?***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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## 3.5 RLF recovery

R3-210347, R3-210389, R3-210458, R3-210547 and R3-210721 discuss RLF recovery. R3-210389 and R3-210458 propose that for RLF recovery via RRC Reestablishment, gradual and full migration using top-down sequence should be supported.

***Proposal: For RLF recovery via RRC Reestablishment, F1 transport with the initial donor can be retained and routed via the recovered path.***

***Q9.1: Do you agree with this proposal?***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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R3-210547 proposes discussion on RLF recovery for simultaneous connectivity using non-DC approaches.

***RAN3 to discuss RLF recovery for simultaneous connectivity using non-DC approaches, if agreed.***

***Q9.2: Do you agree with this proposal?***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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R3-210721 proposes that for the recovery of RLF occurring on one path for an IAB-MT with simultaneous inter-donor connectivity, all traffic can be rerouted to the other path without need for IAB-DU migration.

***For the recovery of RLF occurring on one path for an IAB-MT with simultaneous inter-donor connectivity, all traffic can be rerouted to the other path without need for IAB-DU migration.***

***Q9.3: Do you agree with this proposal?***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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## 3.6 Other topics

R3-210541 discusses data forwarding during inter-donor migration of IAB-MT and IAB-DU. The moderator believes that this is an important topic which needs more discussion:

***Proposal: RAN3 to discuss UE data forwarding for during the inter-donor migration of IAB-MT and IAB-DU.***

***Q10.1: Do you agree with this proposal?***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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Another topic relates to the terminology used. While the terms *top-down*, *bottom-up* and *nested* have been used in the discussions for convenience, we may not want to consider them in specifications.

***Proposal: In the context of inter-donor migration sequences, the terms “top-down”, “bottom up” and “nested” will not be used in specification.***

***Q10.2: Do you agree with this proposal?***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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In the last meeting, we have introduced the term “DAPS-like”. R3-210721 further introduced the term *DIPS*. In case DAPS finds approval to be used as a baseline procedure for simultaneous MT connectivity to two donors, the moderator believes that we should keep the term *DAPS* as is, even though enhancements are necessary. We also kept the terms *NR-DC* and *EN-DC* for Rel-16 IAB even though significant changes we necessary.

***Proposal: Keep the term “DAPS” even after enhancements have been made for the support of Rel-17 IAB.***

***Q10.3: Do you agree with this proposal?***

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes | If we keep the term DAPS, all future enhancements to DAPS need to consider backhaul. If we rename it to XXX, it would require separate efforts to enhance XXX independently of DAPS. |
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Please list additional aspects that should be addressed.

***Q10.4: Additional aspects that should be addressed?***

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| **Company** | **Yes/No** | **Comments** |
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## 3.6 Text Proposal to TS 38.401 on IAB-MT migration via Xn handover

The st2 text proposal below closely follows that of Rel-16 intra-CU topology adaptation. For the inter-donor procedure described here, one child node has been added to the migration IAB-node to capture the additional IP address step for this child node.

***Q 11.1: Do you agree with these flow charts? What changes would you propose?***

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| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
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| BEGIN CHANGES |

### 8.x Inter-donor-CU topology adaptation procedure via handover

During the inter-donor-CU topology adaptation via Xn handover, the source parent node is served by a different IAB-donor-CU than the target parent-node. Figure 8.x-1 shows an example of an IAB topology, where IAB-node 3 migrates between IAB-donor-CU 1 and IAB-donor-CU 2. In the following, IAB-node 3 is also to as the migrating IAB-node. IAB-node 3 has IAB-node 4 as child node, which serves one UE.



**Figure 8.x-1: Example for IAB topology with inter-donor-CU IAB-node migration**



**Figure 8.x-2: Procedure for inter-donor IAB-node migration using Xn handover procedure**

Figure 8.x-2 shows the inter-donor IAB-node migration procedure using Xn handover for the topology shown in Figure 8.x-1. The procedure has the following steps:

1a: IAB-donor-CU1 initiates the handover procedure for IAB-MT3 with IAB-donor-CU2 as defined in TS 38.300 [zz]. This procedure may include allocation of IP addresses for IAB-node 3 that are anchored at the target-path IAB-donor-DU, i.e., IAB-donor-DU2. IAB-donor-CU2 further configures BH RLC channels, BAP routing and mapping rules on the target path for IP traffic from and to IAB-node-3 and its descendent nodes (i.e. IAB-node-4). This configuration may be conducted after receiving the Xn Handover Request message.

Editor’s NOTE: Details on IP address allocation for IAB-node-3 are FFS.

Editor’s NOTE: Details on configuration of BH RLC Channels and BAP routing on the target path are FFS.

1b: The IAB-node-3 establishes TNL connectivity to the IAB-donor-CU1 via the target path and migrates F1-C association and F1-U connections to the target path. This step is the same as step 12 in the IAB intra-CU topology adaptation procedure (section 8.2.3.1). IAB-node 4 allocates new IP addresses that are anchored at the IAB-donor-DU on the target-path, i.e., IAB-donor-DU 2. IAB-node-4 establishes TNL connectivity to the IAB-donor-CU1 via the target path and migrates F1-C associations and F1-U connections to the target path. This step is the same as step 12 in IAB intra-CU topology adaptation procedure (section 8.2.3.1). After completion of this step, IAB-node 3 and IAB-node 4 have IP connectivity to IAB-donor-DU1 via the target path.

Editor’s NOTE: The procedure for the allocation of IP addresses for IAB-node 4 are FFS.

2a: IAB-node 3 establishes an F1-C association with IAB-donor-CU2. This establishment is triggered by IAB-donor-CU1. IAB-node 3 retains the F1-C association with IAB-donor-CU1. IAB-DU3 supports all those serving cells at the radio air interface that have been activated by IAB-donor-CU1 as well as those that have been activated by IAB-donor-CU2.

Editor’s NOTE: The procedure to trigger establishment of F1-C association with IAB-donor-CU2 is FFS.

Editor’s NOTE: FFS how IAB-donor-CU1 knows that F1-C association is established.

2b: IAB-donor-CU1 initiates the handover procedure for IAB-MT4 with IAB-donor-CU2 as defined in TS 38.300 [zz]. As part of this procedure, IAB-donor-CU1 sends an RRC Reconfiguration with resync to IAB-MT4 which is delivered via a serving cell activated by IAB-donor-CU1. This RRC Reconfiguration message includes the NCI of IAB-donor-CU2. IAB-MT4 performs the RA procedure at a serving cell activated by IAB-donor-CU2 and then sends the RRC Reconfiguration Complete message to IAB-donor-CU2. At the end of this procedure, IAB-MT4 is served by IAB-donor-CU2.

Editor’s NOTE: The procedure to trigger establishment of F1-C association with IAB-donor-CU2 is FFS.

Editor’s NOTE: The release of IAB-node-3’s F1-C association with IAB-donor-CU1 is FFS.

3a: IAB-node 4 establishes an F1-C association with IAB-donor-CU2. This establishment is triggered by IAB-donor-CU1. IAB-node 4 retains the F1-C association with IAB-donor-CU1. IAB-DU4 supports all those serving cells at the radio air interface that have been activated by IAB-donor-CU1 as well as those that have been activated by IAB-donor-CU2.

Editor’s NOTE: The procedure to trigger establishment of F1-C association with IAB-donor-CU2 is FFS.

Editor’s NOTE: FFS how IAB-donor-CU1 knows that F1-C association is established.

3b: IAB-donor-CU1 initiates the handover procedure for the UE with IAB-donor-CU2 as defined in TS 38.300 [zz]. As part of this procedure, IAB-donor-CU1 sends an RRC Reconfiguration with resync to the UE which is delivered via a serving cell activated by IAB-donor-CU1. This RRC Reconfiguration message includes the NCI of IAB-donor-CU2. The UE performs the RA procedure at a serving cell activated by IAB-donor-CU2 and then sends the RRC Reconfiguration Complete message to IAB-donor-CU2. At the end of this procedure, the UE is served by IAB-donor-CU2.

Editor’s NOTE: The procedure to trigger establishment of F1-C association with IAB-donor-CU2 is FFS.

Editor’s NOTE: The release of IAB-node-4’s F1-C association with IAB-donor-CU1 is FFS.

NOTE: Procedures 2a, 2b, 3a, and 3b are optional.

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| END CHANGES |

# PHASE II…[if needed]

If needed

# References

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| --- | --- | --- |
| [R3-210347](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210347.zip) | TP for BL CR to 38.401 on Inter-donor Topology Adaptation Procedures (Qualcomm Incorporated) | other  Move to 13.2.1.1 |
| [R3-210389](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210389.zip) | Inter-Donor IAB Node Migration Discussion (Intel Deutschland GmbH) | discussion  Move to 13.2.1.1 |
| [R3-210429](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210429.zip) | Considerations on top-down sequence during Inter-donor IAB node migration (KDDI Corporation) | discussion  Move to 13.2.1.1 |
| [R3-210458](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210458.zip) | Discussion on inter-donor IAB migration (Fujitsu) | discussion  Move to 13.2.1.1 |
| [R3-210547](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210547.zip) | Inter-CU migration procedure (Huawei) | discussion  Move to 13.2.1.1 |
| [R3-210100](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210100.zip) | Inter IAB donor-CU topology adaptation (CATT) | discussion |
| [R3-210207](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210207.zip) | Further considerations on inter-donor IAB Node Migration procedure (ZTE) | discussion |
| [R3-210216](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210216.zip) | Discussion on inter-donor migration procedure for Rel-17 IAB (Samsung) | discussion |
| [R3-210487](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210487.zip) | discussion on Inter-Donor IAB Node Migration (Nokia, Nokia Shanghai Bell) | discussion |
| [R3-210541](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210541.zip) | Discussion on inter-donor migration considering migration sequences (Google Inc.) | discussion |
| [R3-210721](file:///C:\Users\ghampel\AppData\Local\Temp\Temp1_RAN3_111-e_agenda_with_Tdocs20210121_1219.zip\Docs\R3-210721.zip) | IAB Inter-donor Topology Adaptation (Ericsson) | discussion |