3GPP TSG-RAN WG3 #113-e R3-211001

Online, January 25 – February 4, 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 R3-211044 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-like solution:** 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.** |
| **Ericsson** | We think that a DAPS-like solution (so, not an extension of DAPS, but a dedicated solution similar to DAPS) should be used. The delta with DAPS would be the following:   1. Support for BH RLC channels 2. Support for simultaneous UL, even after RA 3. Two independent protocol stacks (RLC/MAC/PHY) 4. One or two independent BAP entities with some common and some independent functionalities. 5. Each CU allocates its own resources (e.g., addresses, BH RLC channels, etc.) without the need for coordination, and configures each protocol stack. |
| **Huawei** | **Clarify the definition/differencing before make any down-selection.**  Before selecting the baseline procedure, we think further clarification of the two candidates (i.e. NR-DC, and DAPS or DAPS-like) are necessary, to make sure companies are clear and align with the key difference of the two solutions.  For example, with regarding the protocol stack, the IAB-MT supports NR-DC has two sets of RLC/MAC/PHY and a common BAP layer for BH link, each set of RLC/MAC/PHY corresponds to one parent node, and the collocated IAB-DU only has F1 connection with one donor-CU, then how about the descendent IAB nodes and UEs, are they connect to the same or different CU as the boundary IAB-DU?  While for the DAPS-like solution, in fact, we didn’t have sufficient discussion in previous meeting on the design of DAPS-like IAB node. In our view the IAB-MT may also use common BAP layer with two sets of RLC/MAC/PHY to connect with two different parent nodes. So from such point of view, the DAPS-like IAB-MT is similar to the NR-DC IAB-MT. Furthermore, it is still unclear that whether the collocated IAB-DU only connects to one donor CU, or need to maintain connection to both donor CUs. And how about the descendent IAB-nodes and UEs ? |
| Samsung | **The difference between NR-DC and DAPS-like is the key point to determine the use case.**  Under the assumption of IAB-MT’s simultaneously connectivity between two donor CUs, our understanding to NR-DC and DAPS-like solution is:   * NR-DC * the Inter-freq connectivity with two parent nodes. * the simultaneous DL and UL transmission towards two parent nodes are feasible at the IAB-MT side. * The protocol stack is two sets of RLC/MAC/PHY, one common BAP, two sets of PDCP/SDAP, one RRC; * DAPS-like * based on IAB-MT capability, DAPS-like can be used to support inter-freq handover or intra-freq handover. * the DAPS-like solution allows the temporary simultaneous DL transmission towards two parent nodes (whether simultaneous UL transmission is supported or not depends on RAN2 discussion). * the protocol stack can follow legacy DAPS, i.e., two sets of RLC/MAC/PHY, one common BAP, one PDCP/SDAP, one RRC.   Based on the above comparison, NR-DC and DAPS-like solution have clear difference. Then, our view on the applicable use case is   * NR-DC: load balance and robustness. Service interruption does not exist in NR-DC case. * DAPS-like solution: due to uncertainty of simultaneous UL transmission, DAPS-like can be applied for DL load balancing only, and service interruption. For robustness, we are not sure. |
| Apple | **NR-DC is useful for all cases as multiple companies have suggested.**  From our view, defining a differentiating factor for a DAPS-like solution over NR-DC is the key as well. Currently, there does not seem to be a real reason why a DAPS-like solution would be beneficial over NR-DC (which has already been standardized in Rel-16). |
| AT&T | NR-DC is already used for intra-donor topology adaptation, so it should also be supported for the inter-donor case. We are open to further discuss a DAPS-like solution. |

### 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** |  |
| **Ericsson** | Yes | Regarding the procedure itself, we think that only top-level MT context should be migrated at inter-donor RLF, whereas the traffic of its collocated DU and descendant IAB nodes and UEs should stay anchored at the original donor. This is because:   * RLF is unpredictable and migration of all the contexts would take considerable time. * RLF events do not last for long, and it does not make sense to move device contexts back and forth between the donors so often. Very soon the RLF-ed link will recover/improve again and reverse migration will be needed.   If RAN3 prefers to migrate all the contexts (not a good approach), then additional enhancements should be considered, and this should be further discussed. |
| **Huawei** | **Yes** |  |
| **Samsung** | **Yes** |  |
| **Apple** | **Yes** |  |
| AT&T | Yes |  |

## 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, R3-211044 and R3-210487 believe that only the first step of the top-down sequence should be executed, where only the IAB-MT migrates while its collocated IAB-DU, and IAB-DUs and UEs underneath remain at the initial donor. R3-211044 further argues that 1) this should be the approach regardless of whether or not the top-level IAB node can connect to two donors simultaneously; 2) the principle should also be applied for the RLF recovery case.

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** |  |
| **Ericsson** | Yes | And this is where it should stop, nothing else should be migrated.  NOTE: our understanding of the proposal is that *F1 transport migration* means offloading of F1 traffic via another donor, which is different from *F1 connection migration*, which means changing the F1-C or F1-U termination point at donor side.  I suppose that the term F1 traffic comprises the traffic destined to the MTs, as a part of F1-C traffic to their parent DUs?  Let us not use the term “handover”, since there is no mobility here and we do not know yet which procedure will be used. The term “migration” is more adequate. |
| **Huawei** | **Yes** | About the *F1 transport migration,* share view with Ericsson’s NOTE |
| Samsung | Yes | Whether the F1 transport migration is the final step or not, we may need further discussion. |
| Apple | Yes |  |
| AT&T | Yes |  |

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** |  |
| **Ericsson** | No | We think that the solutions involving migration of all devices should be deprioritized. Even if we have a solution for migrating all the devices, there is absolutely no reason to have multiple flavors of it (top-down, bottom-up etc.). Herein, especially the bottom-up solution is problematic |
| **Huawei** | No, but | First, we should confirm that the inter-donor migration can stop at the stage that only the top-level IAB-MT migrates to target path, even without the inter-donor migration of the collocated IAB-DU and/or one or multiple descendent IAB-DUs. The corresponding procedure of ending at such stage should be the baseline for the inter-donor migration.  Then we can continue to discuss the necessity of the IAB-DU migration.  According to some progress in previous meetings, the migration of IAB-DU and all descendent nodes will face a lot of problems, e.g. IAB node needs to maintain two F1 connections to two donor CUs simultaneously, the switch of IAB-DU’s cell and migration of the child IAB-MT/UE should be performed at same time, etc. And these issues will increase the complexity of the IAB-node design (e.g. support two logical DUs) and the whole migration procedure.  Therefore, about the migration of IAB-DU and descendent IAB-DUs, we may need to first clarify the motivation before we agree to do this as a following procedure or precedence procedure.  Based on the above concern, **we suggest to mark this proposal as “to be further discussed”.** |
| Samsung | Yes | In our understanding, the F1 transport migration w.r.t. Q3.1 is the mandatory stage for the inter-donor migration. However, we cannot simply say this should be the final stage. We can take a further comparison as below:   * Way 1: F1 transport migration w.r.t. Q3.1 being final stage   This means that each F1-C TNL association/F1-U should be configured via the coordination between the Source donor CU and target donor CU. Although the signaling introduced during the F1 transport migration can be reduced compared to Way 2 below, the resultant signaling overhead between source donor CU and target donor CU should be last all the time as long as F1 transport is via target path. Please note that, such coordination may be either source donor CU initiated or target donor CU initiated. Moreover, such coordination will delay the configuration towards UE.   * Way 2: F1 transport migration w.r.t. Q3.1 being a middle stage   Indeed, this way will introduce plenty of signaling exchange between the source and target. However, after all context has been migrated to the target, the signaling exchange between source and target is over, and all the work is handed over to the target.  Based on the above analysis, we can observed that, with the increase of period where the IAB node stays in the state of F1 transport migration only, the signaling overhead of way 1 will be increased, even much larger than way 2.  So, at this moment, we cannot say Way 1 is better than Way2.  For top-down and bottom-up, we share E///’s view and would like just keeping one of them, which is top-down sequence. The bottom-up has a problem, e.g., if the migration of top-level IAB node is failed, all the context migration becomes valueless.    So, we suggest to change the proposal as:  ***Proposal: The inter-donor migration of the top-level IAB-MT may be followed (“top down”) 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.*** |
| AT&T |  | We agree that migrating only the top-level MT to the target path avoids significant amount of signaling and processing required to migrate all the descendant IAB-nodes and UEs to the target path. However, RAN3 needs to carefully assess whether stopping at top-level IAB-MT migration is sufficient for Release 17. Migrating only the top-level IAB-MT works well when the inter-donor topology adaptation is temporary. However, there may be cases where a sub-tree may need to be migrated permanently to another donor. For example, in cases where the parent of the migrating IAB-MT is consistently experiencing congestion or poor link quality due to changes in traffic pattern, the sub-tree under the migrating IAB node may be permanently migrated to a neighboring donor to improve network performance. If we restrict Release 17 inter-donor topology adaptation solution to only migration of top-level IAB-MT, we are concerned that some use cases may not be efficiently supported.  In our view, stopping at the top-level IAB-MT is a good solution, and should be applicable to many use cases where IAB node migration will be temporary. However, we think that additionally, Release 17 should continue to develop the full inter-donor topology migration solution to allow migration of descendant nodes and UEs to cover all potential use cases for R17 IAB. |

[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***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | No | The approaches to load balancing and RLF recovery implying the migration of devices other than the top-level MT should be deprioritized and it is especially not viable to allow multiple flavors of it. |
| **Huawei** | See comments | According to our input in previous Q3.2, this proposal should pending RAN3’s consensus on the necessity of IAB-DU migration. |
| **Samsung** | **Yes, with revisions to the proposal.** | About “when …”, we are not sure if the source donor CU can make decision. The reason is that the IAB-DU migration (and UE context migration) should be performed after top-level IAB-DU has established the F1 interface, which is only known by the target donor CU. So, the target node should be the best entity knowing when to start IAB-DU migration.  While, the source can determine whether to perform IAB-DU migration or not.  In this sense, the procedure is:   * the target donor CU sends the request for inter-donor IAB-DU migration when the F1 interface of top-level migrated IAB node is established * the source donor CU can decide whether to accept it or reject it.   With this procedure, the inter-donor IAB-DU migration can be completely controlled by source.  For “***The order of such inter-donor IAB-DU migration is FFS***”, if we agree top-down sequence, the order should be clear, i.e., tier by tier starting from the top-level node. For UE context migration, there is no any specific order requirement. Considering the unclearness of this FFS, we suggest to remove it.  Thus, our suggestion is:  ***Proposal: It is up to the source donor decision whether inter-donor migrations of IAB-DUs are conducted or not after receiving the request from the target donor.*** |
| AT&T | See comments | Please see response to Q3.2. We believe RAN3 needs to first agree on developing the full inter-node migration solution. |

### 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 contribution, 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?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Yes |  |
| Huawei | Yes |  |
| Samsung | Yes |  |
| AT&T | Yes |  |

***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?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Yes, but | Let’s not use the term “handover”, since there is no mobility here, and we do not know yet which procedure will be used. The term “migration” is more adequate. |
| Huawei | Yes |  |
| Samsung | Yes, with revisions. | We understand that, here, “***default mappings***” is for both F1-C/non-F1 and F1-U. Now, we already have default mappings for F1-C/non-F1, the missing part is F1-U.  So, we suggest to change the proposal with more details as follows:  ***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 for F1-C/non-F1/F1-U.*** |
| AT&T | Yes |  |

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***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Some modifications are necessary | The explicit IP address request is not needed – as we agreed at RAN3#109-e, the old donor should indicate to the new donor the following:   * Backhaul and topology-related information, * IP address information   from which the target gets all the necessary info  Let’s not use the term “handover”, since there is no mobility here, and we do not know yet which procedure will be used (yes, the baseline is legacy Xn signaling). The term “migration” is more adequate. |
| **Huawei** | See comment | Agree with Ericsson |
| Samsung | Yes, with some revisions | * Source 🡪 target: if IP addresses in the source is provided to the target, the explicit request may not need, as E///’s point out. * Target 🡪 Source: HO CMD should include the new IP addresses. Also, the new IP addresses should be explicitly included in the HO REQ ACK message with corresponding old IP addresses. The reason is that this can be used by the source IAB donor CU to make the group update for the IP address of all F1-U tunnels and F1-C TNL association at the migrated IAB node side. * Thus, we propose: “***Target donor passes new IP address(es) in HO command to IAB-MT via HO Request ACK, and also explicitly includes new and old IP address(es) in MT HO Request Ack.***” |
| AT&T |  | Yes, with modifications suggested by Ericsson |
|  |  |  |

### 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***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Need to be rephrased | *“One common inter-topology transport mechanism should be defined for all scenarios where traffic between a donor and an IAB node/UE traverses the network under another donor.“* |
| Huawei | Yes | The revised version from E/// also ok. |
| Samsung | Yes, but | In general, we are fine with this approach, and E///’s version looks good.  However, we would see this proposal with Q5.2 as a package. The reason is that, about the signaling design, we are not sure if a common signaling design can be applied for all scenarios; also, we are not sure if the operation at migrating IAB node (for inter-donor migration), the boundary IAB node (for inter-donor redundancy), the descendant nodes are the same for all scenarios. In a word, we don’t want to conclude that the common signaling design and common operation of IAB nodes can be applied to all scenarios.  With this, we would like to add some FFSes together with the proposal, e.g.,  *One common inter-topology transport mechanism should be defined for all scenarios where traffic between a donor and an IAB node/UE traverses the network under another donor. FFS on whether the common signaling design and common operation at the affected IAB node(s) can be applied to all scenarios.* |
| **Apple** | Yes with revisions | We are ok with E///’s or Samsung’s revision. |

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***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Unclear | Is the proposal about F1 interface migration (= changing the F1AP termination point at donor side) or is it about F1 transport migration (= keeping F1 termination points, but changing the path, which now goes via another donor)?  Assuming the latter, we are on a good track, but it is still unclear what “the same information exchange” means. Does it mean that inter-donor BAP routing is the same in both single connectivity (= to one donor) and simultaneous connectivity of TL node to two donors? |
| **Huawei** | See comments | Need more clarification, what is the “information exchange” mean? Should be related to discussion of how to achieve the inter-donor routing. |
| **Samsung** | No | It is too early to have such proposal. Further details can refer to our comments to Q5.1. |
| **Apple** |  | As in 5.1 we can currently declare them FFS and revisit later. |

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?***

|  |  |  |
| --- | --- | --- |
| **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.** |
| **Ericsson** | Look right | We think that **migration of anything else, but the top-level MT should be deprioritized**.  If, however, RAN3 decides to support such a solution (but only in addition to top-level MT only migration), then we think that, instead of focusing on the above details, **they should be considered within a high-level discussion on how F1 association is migrated.** In that sense, the following options should be considered:   * **Opt3:** The DU of the migrating IAB node being provided with information about the target CU during the handover of the IAB-MT and using that information to initiate the F1-Setup procedure with the target * **Opt4:** The source donor CU providing the target donor CU with information about the DU of the migrating IAB node (e.g. served cells, transport layer addresses, etc.), and the target donor CU using information to respond with the F1-setup response message to the DU of the IAB node, once the IAB-MT is handed over to it. * **Opt5:** The source donor CU providing the target donor CU with information about the DU of the migrating IAB node and the target donor CU using information to initiate the F1-setup procedure with the DU of the IAB node, once the IAB-MT is handed over to it. |
| **Huawei** | See comment | Need more clarification.  From the description, it seems both option 1 and option 2 are triggered by source CU, so the difference is the path for establishing F1-C to the target donor?  In addition, based on our feedback in Q3.2 and 3.3, we suggest to discuss this issue later, when RAN3 has consensus that the IAB-DU migration is necessary. |
| **Samsung** | Option 1 with some revision | The IAB-DU migration does not need to be triggered by the source donor. In our understanding, after IAB-MT migration of top-level IAB node, its IAB-DU can start the F1 setup.  For option2, it seems that the F1 setup is established before IAB-MT migration. This may result in problem if IAB-MT migration is failed, i.e., the established F1 is useless. |
|  |  |  |

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 Complete 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 Complete messages can be delivered to the target IAB-donor.***

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

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** |  | Well, there are also companies, such has E///, that, for the reasons above, propose that solutions where anything else but the top-level MT is migrated should be downprioritized.  But, yes, the above considerations are true. |
| Huawei | See comments | It should depends on whether the IAB-DU migration is necessary.  If RAN3 has consensus on support of the IAB-DU migration, the proposal is fine, but what is the mean of “*while RRC Reconfiguration messages can be delivered to the target IAB-donor*”? Is there any RRC Reconfiguration message need to be delivered to target IAB-donor?  If the IAB-DU migration is not needed for the inter-donor migration, the IAB-DU does not need to maintain two F1AP associations at same time, then the proposal is not needed.  So we suggest to postpone this proposal till RAN3 has conclusion on the IAB-DU migration. |
| Samsung | Yes | In addition, when the F1 interface is established towards the target. We should limit that the F1 connection to the source donor can be only used for the transmission of RRCReconfiguration message.  So, we can add one more sentence,  ***the F1AP association with the source donor can be used only for RRCReconfiguration message transfer while the F1AP association to the target donor is established.*** |
| **Apple** | Yes |  |

### 3.3.6 Cell IDs

The chairman note contains the following observation:

|  |
| --- |
| **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-donor 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.** |
| **Ericsson** | Yes | How can we assume that they will not change? Obviously, we must assume that they will change because another IAB-DU in the new donor may already use the PCI.  Does anyone begin to realize how complicated the whole thing with migrating the DUs, UEs and child MTs becomes? |
| **Huawei** | See comments | From our view, the frequency and PCI may not need be changed. But should check with RAN1, 2 and 4 to confirm such understanding. |
| **Samsung** | No | Precisely, the frequency and PCI of the cells with served UEs cannot be changed. |
| **Apple** | Not yet | Since the PCI and frequency of the cells with served UEs cannot be changed. |

***Q7.2: Should RAN1, 2, and 4 be involved if only NCI changes?***

|  |  |  |
| --- | --- | --- |
| **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. |
| **Ericsson** | We must involve these groups anyway | We cannot assume that PCI& freq will remain the same. |
| **Huawei** | Not sure | The NCI will be contained in System information, So the NCI change will result in the system information change, this may have RAN2 impact, so we think at least R2 should be involved. |
| **Samsung** | No | So far, we didn’t identify any impact to the RAN2 since NCI update can be performed via system information update.  However, it is no harm to let RAN2 know our decision. |

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?***

|  |  |  |
| --- | --- | --- |
| **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.** |
| **Ericsson** | Option 2, if RAN3 decides to support DU migration | OAM is in charge of this and it should remain so. |
| Huawei | See comments | If RAN3 agree to have IAB-DU migration, then the NCI of the IAB-DU should be reconfigured, and option 1 seems simpler.  Otherwise, neither of the two options are necessary, since IAB-DU will not migrate to the target IAB-donor. |
| Samsung | Option 1 or 2 |  |
|  |  |  |

## 3.4 Simultaneous IAB-MT connectivity

R3-211044 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.***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Yes |  |
| **Huawei** | **Yes** |  |
| **Samsung** | **Yes** | **Covered by CB#37 as well** |
| **Apple** | **Yes** |  |
| AT&T | Yes |  |

R3-211044 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 (top-level MT) with simultaneous connectivity to two IAB-donors, it should be possible to keep its collocated IAB-DU, all UEs and descendent nodes at donor 1 while routing their F1-U connections via the top-level IAB-MT’s link with donor 2?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Yes and… | The proposals should also mention the IAB-DU collocated with the top-level MT. |
| **Huawei** | Yes, but | Is there any difference with the inter-donor redundancy scenarios? |
| **Samsung** | Yes | This is well covered by CB#37, with also considers the F1-termination point. |
| **Apple** | Yes |  |
| AT&T | Yes |  |

## 3.5 RLF recovery

R3-210347, R3-210389, R3-210458, R3-210547 and R3-211044 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?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Yes |  |
| **Huawei** | See comment | Need more clarify about the intention of this proposal, does it mean that the IAB node is recovered to a new donor, and its F1 connection still retained at the original donor? |
| **Samsung** | Not sure | This depends on how long has been taken by the IAB node. If the time is too long, the F1 connection may be released by the original donor.  Thus, after re-connecting the network, the IAB node should be informed whether the F1 Setup procedure should be performed or not. |
| AT&T | Yes |  |

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?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Yes |  |
| **Huawei** |  | **We want to clarify that the proposal in** R3-210547 is “RAN3 discuss how to support the migration procedure for simultaneous connected IAB-MT, after there are some conclusions on non-DC based migration.” So it seems the proposal in this Q9.2 is different from the original proposal of the contribution.  By the way, we are not sure about the meaning of “using non-DC approaches”, please further clarify that. |
| **Samsung** |  | Share HW’s concern. |
| **Apple** |  | Same concern’s as Huawei. Need clarification on what non-DC approaches mean. |
| AT&T | See comments | Agree with Huawei that this is not a clear proposal. |

R3-211044 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 link 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?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Yes |  |
| **Huawei** | Yes, but | Suggest to use “RLF occurring on one link” instead of “RLF occurring on one path” , since the IAB-MT only see the link to its parent node, even if it receives BH RLF indication from parent node, it still behaves as the link to this parent node is RLF. |
| **Samsung** | Yes |  |
| **Apple** | Yes |  |

## 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?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** |  | If DU migration was agreed, the problem described in the paper would exist, yes. However, we should first agree on stage2 principles. |
| **Huawei** |  | **Agree Ericsson** |
| **Samsung** | **Yes** |  |
| **Apple** |  | Agree with Ericsson |
| AT&T | Yes |  |

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?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Look right | Such colloquial terms are good for discussions but should not enter the specs. |
| **Huawei** | **YES** |  |
| **Samsung** | **Yes** |  |
| **Apple** | **Yes** |  |
| AT&T | Yes |  |

In the last meeting, we have introduced the term “DAPS-like”. R3-211044 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?***

|  |  |  |
| --- | --- | --- |
| **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. |
| **Ericsson** | No | The scale of enhancements needed for legacy DAPS is such that the term DAPS becomes obsolete. |
| Huawei | See comments | Regarding the terminology, not sure this is still DAPS , we use DAPS-like in last meeting since we know that it is different from the legacy UE DAPS. And at this stage, maybe it is more important to first clarify about the concept of such DAPS-like solution for IAB, it will be helpful for us to see the difference between such solution and the NR-DC based solution. |
| Samsung |  | Share the HW’s view.  We need set down DAPS-like solution first. |
| Apple |  | Agree that we need to understand DAPS-like first. Agree with Huawei. |
| AT&T | See comments | Agree with Huawei |

Please list additional aspects that should be addressed.

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

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Ericsson** |  | This summary is quite good, but we feel that sometimes it became too detailed. So, let’s deal with details after stage2 has been established. |
|  |  |  |
|  |  |  |
|  |  |  |

## 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?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| **Qualcomm** | **Yes** |  |
| **Ericsson** | Not right now | We should attempt to kick off a stage2 BL CR but let’s first agree on high-level principles. A good thing with the TP is that it also captures the solution where only top-level MT is migrated and it does not capture more than one option for the massive migration-based approach. |
| **Huawei** | See comment | Share same view as Ericsson, let’s first agree on high-level principles. From our view, the start point of a stage 2 procedure should stop at step 1b. The following steps can be added as optional after we have consensus that the IAB-DU migration is needed. |
| **Samsung** |  | Let’s discuss it in Phase II. |
| **Apple** |  | We should discuss this in Stage 2. |
| AT&T | See comment | We can discuss flow chart details after agreeing on high level principles. However, our view is Release 17 should additionally continue to develop the inter-donor migration solution beyond top-level MT migration to capture all possible use cases. |

|  |
| --- |
| 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.

|  |
| --- |
| 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 |
| [R3-211044](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 |