3GPP TSG-RAN WG3 Meeting #114-e R3-21xxxx

E-meeting, November 1 – 11, 2021

Agenda Item: 13.2.1

Source: Qualcomm Incorporated

**Title:** **CB: # 1302\_IAB\_Inter\_Donor\_Mig**

Document for: Discussion

# Introduction

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| **CB: # 1302\_IAB\_Inter\_Donor\_Mig****-General advise: try to converge on the “low hanging fruit” that makes at least a basic solution work. If enhancements are possible, they can be added on top of the “basic” solution.** **It is strongly recommended to focus the last 3 meetings discussions on topics that reached maturity and that can realistically be turned into full Stage 2 and Stage 3 specifications****- Inter-donor routing: can it be assumed that descendant nodes and UEs are not affected? How should it be setup?** **- Full migration:****- Should the work on Full Migration be carried out in Rel17? Should it be moved to Rel18?** **- Is it possible to conclude from the LSs received on full migration that Alt1 (the two logical DUs use separate physical cell resources) is the prioritized choice for RAN3? Or can Alt1 and Alt2 co-exist?****- Is full migration something that can be addressed in Rel17? If yes, what are the remaining essential issues to be solved?** **- Partial migration:****- IPSec address knowledge: is IPSec address knowledge at the souce IAB-Donor-CU needed? If yes, is there a need for any specification enhancements** **- Is there a need for any specification enhancements to support IP address addition, replacement, and release?****- Is there a need for any specification enhancements to support coupling of IP address (es) used in two CU’s networks?****- Should revocation of partial migration be supported with specific standard changes? If yes, which ones?****- Is there a need for any specification enhancements to support context transfer/QoS information?****- Procedure description over interfaces for support of inter-donor topology adaptation****- Should CHO be supported in Rel17?****- Should RLF Recovery be supported with specific standard changes? If yes, which ones?**(Qualcomm - moderator)Summary of offline disc |

This CB#1302 discussion has two phases:

**Phase 1: Identify potentially achievable agreements for online discussion.**

**Phase 2: TBD**

The deadline for Phase 1 is Thursday, November 4, 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, November 9, 12:00 UTC.

The discussion includes all contributions listed in the reference section.

# For the Chairman’s Notes

Propose the following:

…

# PHASE I: Discussion

## Partial Migration

### IP address allocation boundary node

#### Issue: Explicit signaling of IAB-donor-DU2 IP addresses to CU1

Last meeting agreed:

WA: For no Ipsec/Ipsec transport mode, the source CU can be notified via F1AP Information about the network IP addresses assigned to the boundary node by CU2.

FFS if CU1 needs to know the outer IP addresses for IPSec tunnel mode

Contributions to this meeting discussed ***specific*** reasons why the IP addresses for IPsec tunnel mode ***must*** be explicitly provided via Xn to CU1:

[R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Samsung claims that such explicit signaling is necessary so that CU1 can associated the SCTP INIT packet sent via the target path with the SCTP association it had via the source path. Otherwise, CU1 would not know that SCTP INIT is from boundary node. This would have the benefit that CU1 knows about the successful migration of IAB-MT rather early and start DL F1-U transmission. Otherwise, it would have to wait for the UE CONTEXT RELEASE message from CU2.

[R3-215344](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Nokia claims that in case two of CU1’s IAB-nodes simultaneously migrate to different target CUs, CU1 would receive SCTP INIT from both of them and it would not be able to differentiate which is from whom. Consequently, it would not know how to set the IPv6 FL/DSCP for the SCPT INIT ACK appropriately for the DL mapping. This would imply that either all F1-C uses the same IPV6 FL/DSCP or CU1 is explicitly updated about the boundary node’s IP addresses.

[R3-214924](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) ZTE believes that for CU1 needs to know the outer IP addresses to perform security check, i.e., that the inner packet has used the right outer IP addresses. However, gNB-DU CONFIG UPDATE presently only includes the outer IP addresses for F1-U, not for F1-C/non-F1 traffic. Therefore, gNB-DU CONFIG UPDATE might have to be extended to also include outer IP addresses of F1-C/non-F1 traffic.

[R3-215013](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) CATT believes there that explicit XnAP based signalling allows simultaneous F1-C and F1-U migration, which speeds up the F1-U resume procedure.

**Q1a: Please comment on the issues raised by Samsung, Nokia, ZTE and CATT why for IPsec tunnel mode the IP addresses need to be explicitly included in Xn to CU1 (reasons, no Likes/Dislikes)**

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| Company | Comment |
| QCOM | **On Samsung’s concern:** CU1 can match the two SCTP associations after they have been established based on the gNB-DU ID contained in F1AP. SCTP matching is not necessary and hard to implement since SCTP is terminated on the OS rather than on application layer. Further, DL F1-U transmission can **NOT** start before boundary node has established IPsec to CU-UP, which cannot happen before F1AP gNB-DU CONFIG UPDATE has been exchanged.**On Nokia’s concern:** This is a real problem. However, it already arises for IKE establishment which occurs before SCPT INIT and already uses an IPv6 FL/DSCP. Therefore, matching SCTP associations based on IP address wouldn’t help. Also, forcing all F1-C traffic to use same IPv6FL/DSCP is not a good idea. Finally, including F1-C IP addresses into Xn message does not help for IPsec tunnel mode, where the SeGW is outside the CU and the CU never needs to know the outer IP address. In fact, the CU would solely set IPv6 FL/DSCP on the inner packet and the SeGW would then copy it over to the outer header and add the IAB-DU’s IP address.We propose the following solution to Nokia’s problem:1. Only IPv6FL/DSCP is included in Xn from CU2 to CU1. 2. CU2 configures two DL mappings on donor-DU2, one containing only IP address for F1-C, and the other includes the IP address for F1-C + IPV6FL/DSCP. 3. The donor-DU2 applies precedence for full matches over partial matches. This implies that the IP-address-only DL mapping will be used for IKE and SCTP INIT, and the full match for F1-C afterwards.**On ZTE’s concern:** For IPsec tunnel mode: The outer IP address of F1-C is terminated at SeGW, not at CU-CP. The SeGW knows the outer IP address from IKE handshake. The CU-CP doesn’t have to know it.**On CATT’s comment:** The claim is that F1-U could be migrated without IAB UP CONFIG UPDATE message. We disagree since the IAB UP CONFIG UPDATE includes the UL mappings on topology 2, which the boundary node doesn’t know. |
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#### Issue: IP address addition

CU2 can assign new IP addresses to the boundary node, e.g., for inter-donor redundancy. In this case, CU1 has to be informed which of these IP addresses are used for F1-U tunnel, F1-C, Non-F1 traffic. In case CU1 decides to migrate traffic any of these types to the target path, it needs to inform CU2 which of these IP addresses are used for which traffic to be migrated, so that CU2 can configure the DL mapping.

[R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Qualcomm and [R3-215613](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Huawei propose that Rel-16 RRC signaling can be used by CU2 to configure the new IP addresses. [R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Qualcomm further proposes that Rel-16 is used by the IAB-DU to reports the IP addresses it wants to use to CU1 via F1AP.

**Q1b: For IP address addition: (1) Do you agree that Rel-16 is used for CU2 to configure IP addresses on the boundary node, and for the boundary node to report IP addresses it wants to use to CU1?**

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| Company  | Comment |
| QCOM | Yes |
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#### Issue: IP address replacement/release

On IP address replacement and IP address release, contributions propose the following:

[R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Samsung claims that IP address replacement/release by CU2 requires that old/new IP addresses are sent to CU1. The contributions further claims that both CUs can trigger IP address release.

[R3-214924](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) ZTE believes that IP address replacement and release can be done by CU2 via RRC using Rel-16 signaling.

**Q1c: Should IP address replacement/release reuse Rel-16 procedure (ZTE) or is a new signaling needed (Samsung)?**

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| Company  | Comment |
| QCOM | Rel-16 procedure should be used  |
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### Mapping configurations

#### Issue: UL Mapping configuration on boundary node

[R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Qualcomm proposes that since UL mappings for both topologies are configured via CU1’s F1AP on the boundary node, each UL mapping information needs to incudes a topology identifier.

**Q2.1: Do you agree that the UL mapping configuration on the boundary node needs to include a topology identifier? If not, how does the boundary node differentiate UL mapping on topology 1 vs. topology 2?**

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| Company  | Comment |
| QCOM | Yes |
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#### Issue: DL Mapping configuration at target donor DU2

[R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Qualcomm proposes that for IP address addition, CU1 to report to CU2 the IP addresses selected by the boundary IAB-node for the various traffic types so that CU2 can configure the DL mapping.

**Q2.2: Do you agree that for IP address addition, CU1 to report to CU2 the IP addresses selected by the boundary IAB-node for the various traffic types so that CU2 can configure the DL mapping?**

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| Company  | Comment |
| QCOM | Yes |
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#### Issue: Configuration of BAP header rewriting

[R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Samsung proposes that the header rewriting configuration is provided to the boundary node together with routing and bearer mapping configurations via F1AP.

**Q2.3: Do you agree header-rewriting configuration is configured together with routing and bearer mapping configurations via F1AP?**

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| Company  | Comment |
| QCOM | Yes |
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### Xn signaling for QoS info/L2 info transfer

#### Issue: Xn signaling for boundary node

[R3-215344](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Nokia and [R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Qualcomm propose that the QoS info/L2 info can be included in the Xn HO preparation procedure.

[R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Samsung, [R3-215344](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Nokia and [R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Qualcomm propose that a separate Xn procedure is introduced for QoS info/L2 info transfer for QoS info update, e.g., for new bearers, to modify bearers or in case the number QoS info/L2 info does not fit into the Xn HO Preparation message.

[R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Samsung further proposes that the QoS info transfer CU1->CU2 can be triggered by:

**Option 1**: explicit Xn indication from CU2 to CU1 upon reception of the boundary IAB-MT’s RRC Reconfiguration Complete message.

**Option 2**: implicit SCTP-based indication (SCTP INIT) or F1AP-based indication (gNB-DU CONFIG UPDATE) from descendent node to CU1 received after IAB-MT’s migration.

[R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Qualcommand[R3-214924](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) ZTE propose that CU1 and CU2 retain XnAP IDs after CU2 has sent the UE Context Release message (for the boundary IAB-MT) to CU1. [R3-214924](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) ZTE further proposes that CU1 indicates to CU2 that the XnAP IDs should be kept.

**Q3.1: Please provide comments on:**

**a) QoS info/L2 info can be included in the Xn HO Preparation procedure.**

**b) QoS info/L2 info can also be exchanged via separate Xn procedure, which uses UA signaling.**

**c) If this separate procedure should be triggered by Option 1 or Option 2.**

**d) CU1 and CU2 retain the Xn AP IDs after CU2 has sent the UE Context release message.**

**e) CU1 indicates to CU2 to retain the Xn AP IDs.**

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| Company  | Comment |
| QCOM | a) yesb) yesc) Option 2, i.e., no new signaling needed.d) yese) may not be necessary since CUs know that this is partial migration.  |
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#### Issue: Xn signaling for descendent node

This section is about descendent-node reconfiguration. It is not about avoidance of descendent-node reconfiguration which, based on RAN3 agreement, will be discussed in 13.2.2.

[R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Samsung, [R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Qualcommand[R3-215344](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Nokia propose that for IP address reconfiguration of descendent nodes, an Xn procedure between CU1 and CU2 is used, and CU1 then adds or replaces the IP addresses on the descendent node via RRC.

[R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Samsung further propose that the same Xn procedure used for IP address request/reply can also be used for transfer of the descendent node’s QoS info/L2 info.

[R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Samsung further proposes that this procedure is used for partial migration, inter-donor redundancy and RLF recovery.

[R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Qualcomm proposes that a UA Xn message for the boundary node is used for this purpose so that CU2 returns IP addresses for the boundary-node’s donor-DU2. CU1’s UA Xn IP address request should further contain a “descendant-node indicator” so that CU2 know that this request is not for the boundary node.

[R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Samsung proposes that as the baseline, the reconfiguration of the descendent node occurs after the successful migration of the boundary node.

**Q3.2: Do you agree that:**

**a) for IP address reconfiguration of descendent nodes, an Xn procedure between CU1 and CU2 is used, and CU1 then adds or replaces the IP addresses on the descendent node via RRC**

**b) the same Xn procedure can be used for transfer of the descendent node’s QoS info/L2 info**

**c) this procedure is used for partial migration, inter-donor redundancy and RLF recovery.**

**d) a UA Xn message for the boundary node is used for this purpose so that CU2 returns IP addresses for the boundary-node’s donor-DU2.**

**e) CU1’s UA Xn IP address request should further contain a “descendant-node indicator” so that CU2 know that this request is not for the boundary node.**

**f) the reconfiguration of the descendent node occurs after the successful migration of the boundary node.**

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| Company  | Comment |
| QCOM | a) yesb) yesc) yesd) yese) yesf) yes |
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#### Issue: Xn QoS info/L2 info for boundary-node traffic

[R3-215344](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Nokia and [R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Qualcomm discuss QoS info/L2 transport info to be exchanged. The following information exchange can be derived for boundary node traffic.

CU1->CU2

* **QoS info per traffic type for non-UP traffic and per one or bundle of F1-U tunnels for UP traffic** (aligned with RAN3 agreements)

CU2->CU1

* **DL: IPv6 FL/DSCP value for each QoS info**
* **UL: UL BH mapping for each QoS info**

CU2 must forward the UL BH mapping for topology-2 traffic since it is configured on the boundary node by CU1 via F1AP.

**Q3.4: Do you agree with this information exchange?**

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| Company  | Comment |
| QCOM | yes |
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#### Issue: Xn QoS info/L2 info for descendent-node traffic

This is based on the assumption that BAP header rewriting is configured by CU1’s F1AP

CU1->CU2

* **QoS info per traffic type for non-UP traffic and per one or bundle of F1-U tunnels for UP traffic**

CU2->CU1

* **DL: IPv6 FL/DSCP value for each QoS info**
* **DL: For each QoS info: BAP routing ID used in topology 2 and ingress BH RLC CH ID**
* **UL: For each QoS info: BAP routing ID used in topology 2 and egress BH RLC CH ID**

Note that CU1 does not have to send topology 1 info to CU2 if it performs the configuration via F1AP.

**Q3.4: Do you agree with this information exchange? Otherwise, what would you change?**

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| QCOM | yes |
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### Revocation of inter-donor topology adaptation

R3-214822 Ericsson observes that presently, there is no way for a CU1 to request from CU2 to hand back the boundary IAB-MT. The contribution proposes the following two options:

* **Option 1:** A new XnAP procedure enabling CU1 to request revoking of partial migration from CU2.
* **Option 2:** An enhancement to an existing XnAP procedure.

The contribution further proposes to introduce a unified revocation procedure for single- and dual-connected boundary node scenarios.

[R3-214924](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) ZTE and [R3-215613](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Huawei propose to use the existing Xn Handover procedure for revocation of partial migration.

[R3-214924](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) ZTE proposes, that for this purpose, the XnAP IDs should be kept after initial handover. Further, CU1 should indicate to CU2 during the initial handover that the XnAP IDs should be kept. This aspect has already been discussed above under *Xn signaling for boundary node*.

[R3-215013](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) CATT proposes that after the revocation procedure, CU1 informs CU2 to release or suspend the configuration on the former target path (i.e., the path in topology 2).

**Q4.1: Please provide your views on:**

**a) the existing Xn HO procedure is used for revocation of partial migration, or a new procedure is introduced for revocation of topology adaptation of single and dual-connected boundary node.**

**b) CU1 can request revocation of partial migration from CU2**

**c) after revocation, CU1 informs CU2 to release or suspend the configuration on the path via top 2.**

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| Company  | Comment |
| QCOM | The main question is: **What event should trigger the revocation**? The partial migration was triggered by the boundary IAB-MT’s measurement report to CU1. However, the boundary IAB-MT does not send measurement reports to CU1 AFTER migration. **So how does CU1 or CU2 know that revocation would be beneficial?**As a baseline, the existing Xn HO procedures should be used for revocation of partial migration. For dual connectively, there is no need for a revocation procedure.  |
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### Inter-donor RLF recovery

R3-214822 Ericsson observes that the present RRC Reestablishment procedure is not sufficient for RLF recovery of the boundary node since CU2 cannot asses from the RRC Reestablishment Request, what resources are needed to take on the boundary node’s and subtree’s traffic. The XnAP Retrieve UE Context procedure then allows CU1 to pass information (e.g., QoS info) to the CU2, but it does not allow CU2 to confirm/reject the recovery request based on this information.

The contribution therefore proposes a new procedure containing the following 3-way handshake:

* Step 1: The target donor contacts the source donor, inquiring about the necessary resources to serve the node attempting RRC Reestablishment and its descendants.
* Step 2: The source donor replies.
* Step 3: The target donor confirms or rejects.

R3-215302 Motorola proposes that IP address addition can be applied for the inter-donor RLF recovery procedure.

[R3-215613](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Huawei proposes that information about IP addresses requested by the recovering IAB node is included in the RRC container and transferred for the Xn context fetch procedure.

**Q5.1: Please phrase your views:**

**a) How CU2 can confirm/reject RLF recovery attempt within the existing Xn procedures, or if a new procedure is necessary.**

**b) How IP address allocation for the recovering IAB-node (boundary node) is performed.**

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| Company  | Comment |
| QCOM | a) We don’t think that rejection of RLF Recovery of an IAB-node is a good idea in a properly managed network. A new procedure is therefore not needed. After context fetch, transfer of QoS info/L2 info can use the new Xn procedure introduced for Partial Migration above.b) For IP address allocation: We can do IP address assignment as for partial migration. CU1 inserts the corresponding request in the Xn context transfer. |
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## Inter-donor DU migration

This topic has been controversial in the past. RAN3 sent an LS to RAN1, 2, and 4 and received the reply LSs prior to this meeting. The reply LSs were also discussed in contributions to this meeting.

The reply LSs contained follow-up questions:

RAN1 asked for clarification on Alt2:

***Understanding 1****: The two DUs can be switched ON and OFF in a dynamic manner.*

***Understanding 2:*** *The two DUs can be switched between ON and OFF only once.*

RAN2 asked for clarification on the RAN3 terminology related to ‘physical cell resources’:

*What is the exact meaning of the separate vs. shared ‘physical cell resources’ concept in the assumed scenarios? For separate ‘physical cell resources’, does RAN3 consider the cells to use different frequencies or to perform time-multiplexing on the same frequency?*

For Alternative 1, the RAN WGs replied:

* RAN1: RAN1 has not identified any technical issues for Alt1.
* RAN4: Alternative 1 can be supported without impact to RAN4 specification TS 38.133.
* RAN2: RAN2 considers Alt1 to be a feasible solution, even though a technical analysis on the specification impact in RAN2 is needed for Rel-17 full migration scenario being considered by RAN3. The UE needs to perform the legacy handover procedures if Alt1 is adopted, and some companies in RAN2 foresee potential standardisation effort for RAN2 if Alt1 is adopted by RAN3.

For Alternative 2, all three WGs see significantly more issues.

Based at last in part on these reply LSs, contributions to this meeting propose the following related to Alt1 and Alt2:

[R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Samsung, [R3-214924](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214924.zip) ZTE, [R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214953.zip) Qualcomm, [R3-215013](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215013.zip) CATT believe that Full Migration should be based on Alt1 (as the baseline).

[R3-214869](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214869.zip) Fujitsu also discusses solutions for Alt2.

[R3-215749](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215749.zip) Huawei believes that Alt2 should be down-scoped.

[R3-215495](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215495.zip) AT&T believes that selection between Alt1 and Alt2 is not necessary since they can co-exist by time-multiplexing same carrier on IAB-DU1 and IAB-DUs.

Contributions to this meeting further raise issues related to full migration:

R3-214869 Fujitsu , [R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) Samsung, [R3-214924](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214924.zip) ZTE, [R3-215749](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215749.zip) Huawei raised the following issues:

Issue 1: Which node decides to initiate IAB-DU migration and how does this trigger the establishment IAB-DU2’s F1?

Issue 2: How is UE handover initiated after establishment of F1?

Issue 3: Which is the release of the old IAB-DU1 triggered?

Issue 4: How does BAP differentiate DL traffic to IAB-DU1 and IAB-DU2? How will BAP routing be performed on the boundary node in presence of two logical IAB-DUs?

Issue 5: Will both IAB-DUs use the same IP address(es)? How will IAB-DU2 know CU2’ IP address?

Issue 6: How to avoid a signaling storm due to handover of multiple UEs?

Another issue raised by [R3-215749](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215749.zip) was on how IAB-DU migration would be supported if some of the nodes were Rel-16 IAB-nodes. The moderator believes that this is a generic question which also applies to partial migration. For that reason, it should be discussed outside the IAB-DU-migration discussion.

Another issue raised by [R3-215749](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215749.zip) related to top-down, bottom-up and nested sequences. The moderator believes that IAB-DU migration following Partial Migration the understanding so far and that this sequence should be used as the baseline.

[R3-215344](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215344.zip) Nokia, [R3-215749](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215749.zip) Huawei believe that full migration should be done in Rel-18.

[R3-215749](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215749.zip) Ericsson, Huawei, Nokia believe that full inter-donor migration in Rel-17 IAB should be down prioritized.

**The moderator proposes to pursue in the following manner:**

1. RAN3 should evaluate the reply LSs, considers which of Alt1 and/or Alt2 would qualify as a baseline for IAB-DU migration, and consider answering the WGs’ follow-up questions raised in their reply LSs.

2. RAN3 should discuss the issues on IAB-DU migration raised by contributions. This discussion should address the technical matter, i.e., it is not about Yes or No to the feasibility of IAB-DU migration in Rel-17. The outcome of this discussion can help identify the specification effort needed.

3. Based on the outcome of the discussion under bullet 2, RAN3 can discuss deprioritizing IAB-DU migration in Rel-17 and moving it to Rel-18. RAN3 should consider that Rel-18 IAB is still pending on approval by TSG RAN, and moving IAB-DU migration to Rel-18 would also require approval by TSG RAN. Further, TSG RAN would have to approve deprioritization of IAB-DU migration in Rel-17 since it would imply a change to the WID.

### RAN1/RAN2 questions

RAN1 considered the following two understandings:

***Understanding 1****: The two DUs can be switched ON and OFF in a dynamic manner.*

***Understanding 2:*** *The two DUs can be switched between ON and OFF only once.*

RAN2 had the following question:

*What is the exact meaning of the separate vs. shared ‘physical cell resources’ concept in the assumed scenarios? For separate ‘physical cell resources’, does RAN3 consider the cells to use different frequencies or to perform time-multiplexing on the same frequency?*

**Q6.1: Which of Understanding 1 or 2 was RAN3’s intention? What meaning of ‘physical cell resources’ does have RAN3 have in the context of Alt1 and Alt2?**

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| --- | --- |
| Company  | Comment |
| QCOM | On RAN1’s issue: RAN3’s thinking for Alt2 was that of understanding 2, i.e., the two cells of the IAB-DUs were switched over once.On RAN2’s issue: RAN3 considered the cells to use different frequencies. This was the reason why RAN3 considered Alt1 inefficient. RAN3 did not consider a TDM approach as proposed by AT&T in [R3-215495](file:///D%3A%5C%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5C%5CTSGR3_114-e%5C%5CDocs%5C%5CR3-215495.zip).  |
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### Alt1 vs. Alt2

Based on RAN1, 2, 4 reply LSs and discussion in contributions, the moderator believes that Alt1 should be the baseline for further discussion on IAB-DU migration.

AT&T proposed a hybrid approach where IAB-DU1 and IAB-DU2 use the same carrier but time-multiplex the resources using Rel-16/17 HSNA TSM framework.

**Q6.2: Should Alt1 be considered as the baseline for IAB-DU migration? Should time-multiplexing between the two logical IAB-DUs be included into this baseline?**

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| --- | --- |
| Company  | Comment |
| QCOM | Moving forward, Alt1 should be considered as the baseline, where the IAB-DU cells use different frequencies. TDMing can be considered as on optimization. This would primarily involve RAN1. |
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### Other issues raised

#### Issue: Procedural flow of IAB-DU migration

The following question identifies the principal signaling flow of IAB-DU migration assuming that Alt1 is used as baseline and that the two logical IAB-DUs use different carriers.

**Q6.3: Procedural flow:**

**a) Which node initiates the establishment of IAB-DU2’s F1 and how is it triggered?**

**b) How is CU1 informed that F1 has been established so that it can start UE handover?**

**c) How is IAB-DU1’ F1 release triggered?**

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| --- | --- |
| Company  | Comment |
| QCOM | Up front: We think IAB-DU1’s F1AP should not be used to exchange information related to IAB-DU2.a) F1 establishment could be initiated by any of CU1, CU2 or the boundary node itself. * If initiated by boundary node: no signaling needed
* If initiated by CU2: via RRC to boundary IAB-MT
* If initiated by CU1: via XnAP request to CU2, then RRC to boundary IAB-MT

b) CU2 informs CU1 via XnAP that the boundary node 1 “is ready”, after F1AP has been established.c) When CU1 is done handing over, it can simply release F1AP with IAB-DU1. No singaling needed. |
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#### Issue: BAP handling of simultaneous logical IAB-DUs

**Q6.4: How does BAP differentiate DL traffic to IAB-DU1 and IAB-DU2 and how is BAP routing and header rewriting be performed?**

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| Company  | Comment |
| QCOM | The problem is the same as for UL traffic in case of inter-donor-redundancy. The packet’s BAP header is matched with a header-rewriting table. If there is a match, the packet crosses over to the other topology, otherwise it doesn’t. The egress topology determines the logical IAB-DU.RAN2 will be eager to address this problem. |
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#### Issue: IP address handling

Obviously, all traffic running via topology 2 need to use IP addresses allocated by donor-DU2. The boundary node already has such addresses assigned, and IAB-DU1 uses (a subset of) them for traffic with CU1. The question is which subset of IP addresses would IAB-DU2 use for traffic with CU2. Further, how would IAB-DU2 know CU2’s IP address.

**Q6.5:**

**a) Which of the boundary-node’s IP addresses assigned by donor-DU2 is used for IAB-DU2’s traffic with CU2?**

**b) How does IAB-DU2 know CU2’s IP address?**

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| Company  | Comment |
| QCOM | a) To make life simple, IAB-DU2 should use the same IP address for the same traffic as IAB-DU1. In this manner, the same DL mappings on Donor-DU2 can be used. b) Via OAM configuration as we already agreed. |
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#### Issue: Signaling storm

**Q6.6: How can a signaling storm be averted in case many UEs have to be handed over between the two logical IAB-DUs?**

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| Company  | Comment |
| QCOM | There is no signaling storm. Since both logical IAB-DUs can coexist at the air interface for an extended amount of time, the UE migration can occur gradually. |
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# PHASE II: Convergence of PH1

TBD…

# References

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| --- | --- |
| R3-214677 | Reply LS on Inter-donor migration (RAN1) |
| [R3-214690](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214690.zip) | Reply LS on inter-donor migration (RAN2) |
| [R3-214701](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214701.zip) | Reply LS on inter-donor migration (RAN4) |
| [R3-215649](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215649.zip) | Reply LS (to R1-2108529) on Inter-donor migration (Huawei) |
| [R3-215650](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215650.zip) | Reply LS (to R2-2109143) on Inter-donor migration (Huawei) |
| [R3-214822](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214822.zip) | IAB Inter-Donor Topology Adaptation (Ericsson) |
| [R3-214869](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214869.zip) | Procedure of full migration (Fujitsu) |
| [R3-214873](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214873.zip) | (TP to BL CR of TS38.401) Discussion on inter-donor IAB node migration (Samsung) |
| [R3-214924](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214924.zip) | Discussion on IAB inter-donor topology adaptation procedures (ZTE) |
| [R3-214930](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214930.zip) | [Draft] Reply LS to RAN1 on inter-donor migration (ZTE) |
| [R3-214931](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214931.zip) | [Draft] Reply LS to RAN2 on inter-donor migration (ZTE) |
| [R3-214953](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-214953.zip) | (TP for BL CR to 38.401) Inter-donor topology adaptation (Qualcomm Incorporated) |
| [R3-215013](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215013.zip) | Discussion on inter-CU migration for IAB (CATT) |
| [R3-215302](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215302.zip) | Discussion on IAB inter-donor migration (Lenovo, Motorola Mobility) |
| [R3-215344](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215344.zip) | discussion on Inter-Donor IAB Node Migration (Nokia, Nokia Shanghai Bell) |
| [R3-215495](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215495.zip) | Harmonized proposal on alternatives for full inter-donor IAB-node migration (AT&T) |
| [R3-215613](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215613.zip) | (TP for NR\_IAB\_enh BL CR for TS 38.401) Inter-CU topology update (Huawei) |
| [R3-215749](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_114-e%5CDocs%5CR3-215749.zip) | On Full Inter-Donor Migration in Rel-17 IAB (Ericsson, Huawei, Nokia, Nokia Shanghai Bell) |