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

|  |
| --- |
| **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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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)**

|  |  |
| --- | --- |
| 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. |
| Samsung | **To QC’s concern on our proposal:**  We are not intended to associate two SCTP associations. Our essential intention is to ensure the CU1 can set the correct DSCP/FL for the SCTP INIT ACK message since we assume the DL mapping at the CU2’s donor DU is based on IP + FL/DSCP.  Companies may argue that the DL mapping at the CU2’s donor DU can be performed via IP address only. If this is the case, we agree that new IP address via new XnAP is not needed. However, this method brings the restriction. For example, we assume boundary node has one new IP address (IP#1) only. At the CU2’s donor DU, the DL mapping is configured based on IP#1. To ensure the correct transmission of IKE/SCTP packets, the CU2 cannot configure any other DL mappings since the CU2 cannot know which FL/DSCP can be set for IKE/SCTP packets. Among companies’ proposals, the HO REQ message is supposed to have QoS info., which intends to let CU2 configure DL mapping for the corresponding traffic. However, before finishing IKE/SCTP procedures, the DL mapping related to those QoS info. cannot be configured.  **To QC’s proposal for Nok’s concern**  If only FL/DSCP is provided to CU1, CU1 cannot know which packets should be applied those FL/DSCP setting since CU1 does not know the new IP address of the boundary node.  **To Nok’s concern:**  We acknowledge the issue mentioned by Nok. However, forcing all F1-C traffic to use same FL/DSCP is not a good idea since there are other F1-C traffic not belonging to boundary node.  Actually, the better way is to use XnAP to explicit include the new IP address. Meanwhile, the XnAP can be also used to inform CU1 the new IP address for descendant nodes.  So, we prefer to **use XnAP to explicitly indicate the new IP address of boundary node, and also include the FL/DSCP.** |
| r |  |
|  |  |
|  |  |

#### 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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Qualcomm and [R3-215613](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Huawei propose that Rel-16 RRC signaling can be used by CU2 to configure the new IP addresses. [R3-214953](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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?**

|  |  |
| --- | --- |
| Company | Comment |
| QCOM | Yes |
| Samsung | * **CU2 configures IP address on the boundary node**   We understand that here, the Rel-16 scheme means to use RRCReconfiguration message to configure IP address. If so, we agree.  This configuration can be sent to boundary node by CU2 directly via SRB3 or by CU2 indirectly through CU1   * **Boundary node reports IP addresses it wants to use to CU1**   Need clarification. What does “Rel-16” is referring to for IP address report by IAB-DU? In Rel-16, the IP address report is for the case of OAM configured IP address. |
|  |  |
|  |  |
|  |  |
|  |  |

#### Issue: IP address replacement/release

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

[R3-214873](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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)?**

|  |  |
| --- | --- |
| Company | Comment |
| QCOM | Rel-16 procedure should be used |
| Samsung | We understand this Rel-16 procedure is referring to the RRCReconfiguration procedure between CU and IAB node. If this is the intention, we agree to reuse Rel-16 procedure.  Note, in our proposal, we are referring to the enhancement over XnAP signaling. If the replacement is triggered by the CU2, this may need enhancement since Rel-16 does not define this. |
|  |  |
|  |  |
|  |  |
|  |  |

### Mapping configurations

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

[R3-214953](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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?**

|  |  |
| --- | --- |
| Company | Comment |
| QCOM | Yes |
| Samsung | Yes. Detailed topology identifier design needs further discussion. |
|  |  |
|  |  |
|  |  |
|  |  |

#### Issue: DL Mapping configuration at target donor DU2

[R3-214953](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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?**

|  |  |
| --- | --- |
| Company | Comment |
| QCOM | Yes |
| Samsung | Partially yes.  There is no need to mention “for IP address addition”. IP addresses selected by boundary node should be sent to the CU2 during the procedure of QoS information transfer. |
|  |  |
|  |  |
|  |  |
|  |  |

#### Issue: Configuration of BAP header rewriting

[R3-214873](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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?**

|  |  |
| --- | --- |
| Company | Comment |
| QCOM | Yes |
| Samsung | Yes |
|  |  |
|  |  |
|  |  |
|  |  |

### Xn signaling for QoS info/L2 info transfer

#### Issue: Xn signaling for boundary node

[R3-215344](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Nokia and [R3-214953](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Qualcomm propose that the QoS info/L2 info can be included in the Xn HO preparation procedure.

[R3-214873](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Samsung, [R3-215344](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Nokia and [R3-214953](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Qualcommand[R3-214924](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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.**

|  |  |
| --- | --- |
| Company | Comment |
| QCOM | a) yes  b) yes  c) Option 2, i.e., no new signaling needed.  d) yes  e) may not be necessary since CUs know that this is partial migration. |
| Samsung | 1. No.   We understand that the intention of this is to speed up the DL mapping configuration at CU2’s topology. However, during HO preparation procedure, the inter-topology transport cannot be carried out since the CU1 does not get F1-U tunnel switch information (current WA indicates F1-U tunnel switch can only happen after receiving GNB-DU Configuration Update message). Thus, we cannot identify clear benefit to include QoS info in HO REQ message.  In addition, we prefer to have a clean solution, i.e., HO REQ message is only used for boundary IAB-MT handover.   1. Partial Yes. We are ok for the first part. However, we are not OK for UA signaling. The reason is that, such signaling is used to transfer QoS info of traffic belonging to boundary IAB-DU, descendant IAB-MT, and descendant IAB-DUs. In some cases, CU1 may want to offload the traffic belonging to boundary node and descendant node(s) at the same time. If UA signaling is used, it means that several UA procedures should be triggered, each of which belongs to one node. However, if NUA signaling is used, CU1 can trigger one procedure to complete QoS info. transfer for all traffic. Thus, we propose:   **QoS info/L2 info can also be exchanged via separate Xn procedure, which uses NUA signaling.**   1. This relies on conclusion of Q1a. If new IP address is informed via HQ REQ ACK message, “ implicit SCTP-based indication (SCTP INIT)” is a good way since this is the first packet received by the CU1 after boundary IAB-MT migration. For descendant node, we may not need to have a trigger. As long as boundary node access is finished, the QoS info transfer can be triggered. Thus, we propose:   **The trigger for QoS info. transfer CU1->CU2 is needed. FFS on detailed trigger**   1. Yes with rewording, e.g., “ **CU1 and CU2 retain the Xn AP IDs of boundary IAB-MT after CU2 has sent the UE Context release message** during partial migration” 2. No. CU2 knows this is for migration. It can automatically keep the XnAP ID for boundary IAB-MT |
|  |  |
|  |  |
|  |  |
|  |  |

#### 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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Samsung, [R3-214953](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Qualcommand[R3-215344](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Samsung further proposes that this procedure is used for partial migration, inter-donor redundancy and RLF recovery.

[R3-214953](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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.**

|  |  |
| --- | --- |
| Company | Comment |
| QCOM | a) yes  b) yes  c) yes  d) yes  e) yes  f) yes |
| Samsung | 1. Yes 2. Yes 3. Yes 4. Yes if the intention of this is to reuse XnAP HO Preparation procedure of boundary IAB-MT to derive new IP address of descendant node(s) 5. No. we are not sure why CU2 needs to know the IP address is for boundary node or descendant node. The CU1 only needs send the IP request based on the request from boundary node and descendant node, and the CU2 return the corresponding new IP address. How to allocate those IP addresses is CU1’s decision. 6. Yes as the baseline. |
|  |  |
|  |  |
|  |  |
|  |  |

#### Issue: Xn QoS info/L2 info for boundary-node traffic

[R3-215344](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Nokia and [R3-214953](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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?**

|  |  |
| --- | --- |
| Company | Comment |
| QCOM | yes |
| Samsung | Yes with additional info.  CU1🡪 CU2: the DL IP address(es) corresponding to each QoS info. is also needed so that the CU2 can configure the DL mapping. |
|  |  |
|  |  |
|  |  |
|  |  |

#### 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?**

|  |  |
| --- | --- |
| Company | Comment |
| QCOM | yes |
| Samsung | Yes with additional info.  CU1🡪 CU2: the DL IP address(es) corresponding to each QoS info. is also needed so that the CU2 can configure the DL mapping. |
|  |  |
|  |  |
|  |  |
|  |  |

### 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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) ZTE and [R3-215613](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Huawei propose to use the existing Xn Handover procedure for revocation of partial migration.

[R3-214924](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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.**

|  |  |
| --- | --- |
| 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. |
| Samsung | 1. For single-connected, existing HO procedure can be reused for revoke (no enhancement is needed)   For dual-connected, CU1 can trigger revoke due to, e.g., no need for offloading, and new procedure (e.g., reuse the procedure for QoS info transfer) can be used   1. No 2. No. We are not sure the intention of suspend the configuration after revoking. |
|  |  |
|  |  |
|  |  |
|  |  |

### 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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.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.**

|  |  |
| --- | --- |
| 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. |
| Samsung | 1. There is no need specific procedure to confirm/reject RLF recovery. The following-up QoS info transfer procedure can achieve this purpose if the further traffic transfer is not acceptable for CU2, it can reject the transfer. 2. Can reuse the procedure in the partial migration as much as possible. |
|  |  |
|  |  |
|  |  |
|  |  |

## 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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Samsung, [R3-214924](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214924.zip) ZTE, [R3-214953](file:///D:\\会议硬盘\\TSGR3_114-e\\Docs\\R3-214953.zip) Qualcomm, [R3-215013](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215013.zip) CATT believe that Full Migration should be based on Alt1 (as the baseline).

[R3-214869](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214869.zip) Fujitsu also discusses solutions for Alt2.

[R3-215749](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215749.zip) Huawei believes that Alt2 should be down-scoped.

[R3-215495](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215495.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:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) Samsung, [R3-214924](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214924.zip) ZTE, [R3-215749](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215749.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:\会议硬盘\TSGR3_114-e\Docs\R3-215749.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:\会议硬盘\TSGR3_114-e\Docs\R3-215749.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:\会议硬盘\TSGR3_114-e\Docs\R3-215344.zip) Nokia, [R3-215749](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215749.zip) Huawei believe that full migration should be done in Rel-18.

[R3-215749](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215749.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?**

|  |  |
| --- | --- |
| 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:\\会议硬盘\\TSGR3_114-e\\Docs\\R3-215495.zip). |
| Samsung | Share the same understanding as QC |
|  |  |
|  |  |
|  |  |
|  |  |

### 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?**

|  |  |
| --- | --- |
| 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. |
| Samsung | Agree Alt1 with IAB-DU cells of different frequencies as the baseline. |
|  |  |
|  |  |
|  |  |
|  |  |

### 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?**

|  |  |
| --- | --- |
| 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. |
| Samsung | 1. The F1 establishment is always initiated by IAB-DU, which is legacy scheme. Either CU1 or CU2 can trigger it 2. The boundary node can send the indication to CU1 3. CU1 can trigger the release after transfer all UEs to CU2. |
|  |  |
|  |  |
|  |  |
|  |  |

#### 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?**

|  |  |
| --- | --- |
| 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. |
| Samsung | This can be discussed after inter-topology routing discussion in RAN2 is clear. |
|  |  |
|  |  |
|  |  |
|  |  |

#### 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?**

|  |  |
| --- | --- |
| 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. |
| Samsung | 1. Use the same address as assigned during partial migration 2. Via OAM |
|  |  |
|  |  |
|  |  |
|  |  |

#### 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?**

|  |  |
| --- | --- |
| 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. |
| Samsung | The UE handover can be performed gradually. Signaling storm may not be a problem. |
|  |  |
|  |  |
|  |  |
|  |  |

# PHASE II: Convergence of PH1

TBD…

# References

|  |  |
| --- | --- |
| [R3-214677](D:\\会议硬盘\\TSGR3_114-e\\Docs\\R3-214677.zip) | Reply LS on Inter-donor migration (RAN1) |
| [R3-214690](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214690.zip) | Reply LS on inter-donor migration (RAN2) |
| [R3-214701](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214701.zip) | Reply LS on inter-donor migration (RAN4) |
| [R3-215649](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215649.zip) | Reply LS (to R1-2108529) on Inter-donor migration (Huawei) |
| [R3-215650](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215650.zip) | Reply LS (to R2-2109143) on Inter-donor migration (Huawei) |
| [R3-214822](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214822.zip) | IAB Inter-Donor Topology Adaptation (Ericsson) |
| [R3-214869](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214869.zip) | Procedure of full migration (Fujitsu) |
| [R3-214873](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214873.zip) | (TP to BL CR of TS38.401) Discussion on inter-donor IAB node migration (Samsung) |
| [R3-214924](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214924.zip) | Discussion on IAB inter-donor topology adaptation procedures (ZTE) |
| [R3-214930](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214930.zip) | [Draft] Reply LS to RAN1 on inter-donor migration (ZTE) |
| [R3-214931](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214931.zip) | [Draft] Reply LS to RAN2 on inter-donor migration (ZTE) |
| [R3-214953](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-214953.zip) | (TP for BL CR to 38.401) Inter-donor topology adaptation (Qualcomm Incorporated) |
| [R3-215013](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215013.zip) | Discussion on inter-CU migration for IAB (CATT) |
| [R3-215302](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215302.zip) | Discussion on IAB inter-donor migration (Lenovo, Motorola Mobility) |
| [R3-215344](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215344.zip) | discussion on Inter-Donor IAB Node Migration (Nokia, Nokia Shanghai Bell) |
| [R3-215495](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215495.zip) | Harmonized proposal on alternatives for full inter-donor IAB-node migration (AT&T) |
| [R3-215613](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215613.zip) | (TP for NR\_IAB\_enh BL CR for TS 38.401) Inter-CU topology update (Huawei) |
| [R3-215749](file:///D:\会议硬盘\TSGR3_114-e\Docs\R3-215749.zip) | On Full Inter-Donor Migration in Rel-17 IAB (Ericsson, Huawei, Nokia, Nokia Shanghai Bell) |