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

Online, 01-11 Nov, 2021

Agenda Item: 13.2.3

Source: Huawei (moderator)

Title: Summary of Offline Discussion on CB # 1304\_IAB\_Top\_Red

Document for: Approval

# Introduction

This paper is for the following offline discussion:

|  |
| --- |
| **CB: # 1304\_IAB\_Top\_Red****- Is it agreeable that RAN3 works on a unified design of XnAP IEs and F1AP IEs for supporting inter-donor routing setup in all Rel-17 IAB WI scenarios where inter-donor routing is present?****- Can RAN3 agree to any principles/solution for topology redundancy?****- What granularity to choose?****- QoS information handling?****- Can the dependencies with RAN2 be identified?** **- Any other issue?**(HW - moderator)Summary of offline disc [R3-215902](file:///C%3A%5Ctemporary%5CRAN3%5CRAN3%20November%2021%5CCB%20sessions%5CCB1304%20topology%20redundancy%5CInbox%5CR3-215902.zip) |

The following papers will be covered as assigned by the chairman:

[1] R3-214824, Inter-Donor Routing in IAB Topology Redundancy Scenarios (Ericsson)

[2] R3-214875, (TP to BL CR of TS38.423) Discussion on inter-donor topology redundancy (Samsung)

[3] R3-214926, Discussion on inter-donor topology redundancy (ZTE)

[4] R3-214955, Inter-donor topology transport (Qualcomm Incorporated)

[5] R3-215015, Discussion on inter-CU topology redundancy (CATT)

[6] R3-215304, Discussion on IAB inter-donor topology redundancy (Lenovo, Motorola Mobility)

[7] R3-215611, Inter-CU topology redundancy (Huawei)

[8] R3-215346, discussion on Inter-Donor IAB Topology Redundancy (Nokia, Nokia Shanghai Bell)

Phase I：Please give your feedback before Thursday, 4th Nov, 2021, 23:59 UTC. This allows us to give some input for Monday’s online session (8 Nov, 2021).

Phase II：TBD.

# For the Chairman’s Notes

For Chairlady to copy:

**Procedure**

* **Agree to introduce a new Xn procedure for inter topology migration of F1 transport, FFS on UA or NUA.**
* **Agree to wait for RAN2's progress on BAP operation (e.g., header rewriting, routing, bearer mapping)**
* **E2E QoS requirement are divided into two parts: provided by its own topology fragment, provided by the non-F1-terminating CU’s topology fragment, which is up to implementation of CU1.**
* **For DL descendent node traffic:**
* **CU1->CU2:**

**- QoS info.**

**- A list of DL IP addresses**

**- egress BAP routing ID, egress BH RLC CH**

* **CU2->CU1**

**- for each egress BAP routing ID received from CU1: a list of {DSCP/IPv6 flow label, ingress BAP routing ID, ingress BH RLC CH ID}**

**- FFS: prior-hop BAP address**

* **For UL descendent node traffic:**
* **CU1->CU2:**

**- QoS info.**

**- ingress BAP routing ID, ingress BH RLC CH**

* **CU2->CU1**

**- for each ingress BAP routing ID received from CU1: egress BAP routing ID, egress BH RLC CH ID**

**- FFS: next-hop BAP address for UL**

**FFS: additional info, stage-3 details for signaling design.**

* **WA: If non-F1-terminating CU is not able to guarantee the per topology fragment QoS requirement, e.g. by configuring less or equal egress routing ID/BH RLC CH than the ingress ones, it should reject the request from F1-terminating CU.**
* **The granularity of the informed QoS requirement info is "per GTP-U tunnel”or "per group of GTP-U tunnels"**
* **About non-F1-U traffic type, the information to be exchanged between the F1-termination donor and non-F1-termination donor include:{** **UE-associated F1AP, non-UE-associated F1AP, non-F1 }, FFS for other info.**

**CP/UP separation**

* **Agree to add "IAB Node Indication" to set up dual-donors DC for the IAB node, for scenario 1.**
* **WA: the IAB-node can be configured with the CG to be used to transmit F1-C, i.e., via f1c-TransferPath-r17 {mcg, scg, both}. For the detailed IAB-node behavior upon reception of the CG, it is up to RAN2 to discuss.**
* **A node broadcasting "IAB-support" supports full IAB functionality, RAN3 will not pursue to define a third type of donor node (broadcasting "IAB-support" but not support full IAB functionality)**

To be continued

* **Continue to discuss if any further information are needed to be exchanged between CU1 and CU2 for DL/UL descendent node traffic handling**
* **Whether to introduce an explicit request for MN to indicate to SN its intention to send F1-C traffic over SRB.**
* **Whether to introduce any enhancements to support revoking mechanism**

Discussion details:

**Procedure**

1. Whether a new Xn procedure is needed, UA or NUA?

9 companies participated, 7 companies preferred new procedure, but there is no clear majority on UA or NUA; one company preferred existing procedure, one company seems to be ok with either way.

**Proposal 1: Agree to introduce a new Xn procedure inter topology migration of F1 transport, FFS on UA or NUA.**

2. BAP operation

All the companies shared similar view that it is RAN2 scope and RAN3 should wait RAN2's progress.

Proposal 2: **Agree to wait for RAN2's progress on BAP operation (e.g., header rewriting, routing, bearer mapping)**

3. Concatenated traffic handling

**Proposal 3: E2E QoS requirement are divided into two parts: provided by its own topology fragment, provided by the non-F1-terminating CU’s topology fragment, which is up to implementation of CU1.**

All the companies shared the similar view that the E2E QoS requirement should be divided into two parts, just one company expressed the concern that it might be difficult to do that since the F1-terminating CU might be difficult to have all topology information of the non-F1-terminating CU’s, and all the companies seem to share the view that it is up to implementation of CU1.

4. DL descendent node traffic:

**CU1->CU2: {QoS info., A list of DL IP addresses, egress BAP routing ID, egress BH RLC CH }**

**CU2->CU1: for each egress BAP routing ID received from CU1, a list of {DSCP/IPv6 flow label, ingress BAP routing ID, ingress BH RLC CH ID}**

5. UL descendent node traffic:

**CU1->CU2: {** **QoS info., ingress BAP routing ID, ingress BH RLC CH }**

**CU2->CU1: for each ingress BAP routing ID received from CU1: egress BAP routing ID, egress BH RLC CH ID, FFS: next-hop BAP address for UL**

**FFS: other info, stage-3 details for signaling design**

All the companies understood the intention that 1:N mapping should be avoided, so the design should reflect the approach that for both UL and DL the egress link should be associated with one or more ingress link. So all the companies shared similar view on the mapping relation between ingress link and egress link, then some companies also commented that some related address should be exchanged, this point could be further discuss in details.

QC also suggestion to change concatenated to descendant.

6. **WA: If non-F1-terminating CU is not able to guarantee the per topology fragment QoS requirement by configuring less or equal egress routing ID/BH RLC CH than the ingress ones, it should reject the request from F1-terminating CU.**

8 the companies shared similar view that if request could not be guaranteed, the target could reject the request, just one company commented that partial acceptation for both UL and DL could be considered, then there might be further discussions on the detailed reject message, e.g. the list of failed request

7. **the granularity of the informed QoS requirement info is "per GTP-U tunnel”or "per group of GTP-U tunnels"**

All the companies agreed with "per GTP-U tunnel”or "per group of GTP-U tunnels"

8 **About non-F1-U traffic, the information to be exchanged between the F1-termination donor and non-F1-termination donor include:{F1-C, non-F1, both}, FFS for other info**

All the companies agree that traffic type should be include; for other info, they are mainly about ingress/egress BAP routing ID, BH RLC CH, TNL address of boundary node and/or descendant nodes, which could be further discussed

**CU/UP separation**

1. **Agree to add "IAB Node Indication" to set up dual-donors DC for the IAB node, for scenario 1.**

All the companies agreed this proposal, two companies shared similar view that this proposal should just be applied to scenario 1.

2. **WA: the IAB-node can be configured with the CG to be used to transmit F1-C, i.e., via f1c-TransferPath-r17 {mcg, scg, both}. For the detailed IAB-node behavior upon reception of the CG, it is up to RAN2 to discuss.**

All the companies shared similar view, but two companies thought that this should be up to RAN2 to discuss, and 6 companies shared the similar view that the detailed IAB-node behavior upon reception of the CG, it is up to RAN2 to discuss.

3. **A node broadcasting "IAB-support" supports full IAB functionality, RAN3 will not pursue to define a third type of donor node (broadcasting "IAB-support" but not support full IAB functionality)**

The majority shared similar view that there is no need to introduce a third type of donor node (broadcasting "IAB-support" but not support full IAB functionality)

**Others**

1. For revoking, 7 companies participated the discussion, there is no consensus on this topic, and CB#1302 also touched this topic.

# Discussion

In last RAN3 113-e meeting, the following agreements were achieved about Topology Redundancy:

* *1a: RAN3 assumes that the boundary node has only one BAP address in each topology.*
* *1b: RAN3 assumes that for each topology, the boundary node’s BAP address for that topology is only used to identify packets that have to be passed to upper layers.*
* *1d: Liaise RAN2 to consider RAN3’s preferences when discussing BAP processing at the boundary node.*
* *1e: For DL traffic, the configurations of BAP routing entry and BAP-routing-ID mapping at the boundary node need to indicate the ingress topology they refer to. For UL traffic, they need to indicate the egress topology they refer to. The indications may be implicit.*
* *2a: The QoS info can be passed gradually using multiple Xn messages.*
* *2b: As a baseline, RAN3 assumes that each of BAP-routing-ID mapping and BH RLC CH mapping at the boundary node are constraint to 1:1 and N:1. Support for 1:N mapping is FFS. RAN3 to liaise RAN2 on this assumption.*
* *2c: For UP access traffic to the boundary node, QoS info to be passed over the Xn interface with granularity of one or multiple F1-U GTP-U tunnels.*
* *If IAB node establishes NRDC before F1-C, the IAB node can implicitly derive whether MN or SN is the F1-terminating donor, e.g., based on who provides the default BAP configuration.*

Moderator’s Note: the discussion tries to split into three parts, the first one is for inter-donor routing which should cover partial migration, dual connectivity and re-establishment under RLF case; the second one is about CP/UP separation where the main focus should be the info exchange between two donors, the third is about others.

## Inter-Donor routing

Here the first question we need to discuss is about the general principles, i.e. new or existing procedure, UE associated or non-UE associated and the overlaps with RAN2. Then, we need to discuss the further details about F1-terminating CU/non-F1 terminating CU, handling of concatenated traffic

### Procedure

**Q1: Whether a new Xn procedure is needed, whether it is UE associated or non-UE associated?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM |  | There is some overlap with CB1302.The question presumable addresses exchange of QoS info (CU1->C2)/L2 info (CU2->CU1).We propose:* QoS info/L2 info exchange can use IAB-MT’s HO preparation.
* It can also occur via a new Xn procedure, e.g., if the info is too large to fit into Xn HO preparation, if new bearer arrives, gradual load offloading in DC, etc.

The new Xn procedure must be UA (i.e., on behalf of boundary IAB-MT) to indicate the boundary node it is referring to. |
| Samsung  |  | New Xn procedure is needed. We prefer to have NUA procedure since this procedure is used to transfer QoS info of multiple UEs. |
| Lenovo |  | A new Xn procedure is needed for passing of the QoS info. And UE associated is preferred since the QoS info is specific for per boundary node. |
| CATT | New Xn procedure;Non UE associated | We would like to use a new XnAP message to cover more than one F1-Us’ QoS information. These QoS information are related to descendant nodes and UEs hence it is a non UE associated signaling. A list with the (BAP routing ID/BH RLC CH, QoS) may be needed. The normal Xn handover request conveys the QoS information of boundary node only. The new Xn procedure also allows add/modify the QoS information. |
| Huawei | Not sure | In general, we think we could just enhance the existing Xn procedure, as the QC’s concern on large size, we think anyway it is wireline transmission with IP packet over transport layer which should not be subject to size limitation. |
| Fujitsu | Yes | A new Xn procedure for traffic offload request and acknowledge is needed. It can be common for both inter-donor topology redundancy and partial migration scenarios. UE associated procedure is preferred. |
| ZTE |  | The new UE-associated Xn procedure (i.e., on behalf of boundary IAB-MT) is preferred. If using non-UE-associated message, the boundary node identity needs to be included as well.  |
| Nokia | Yes | Slightly prefer UE-Associated. In case it is Non-UE-Associated, the message needs to include an ID of the IAB. one NUA message can include the information for multiple IABs. This may be the only benefit for using NUA. However, it may be clean to use the UA, e.g. one message is only for one IAB.  |
| **Ericsson** | Yes | Our view is:* A **new** procedure is needed.
* If we define a new procedure, it should be a **unified procedure,** covering both TopRed, partial migration and inter-donor RLF recovery scenarios.

For **TopRed** case, it makes sense that a new procedure is **UA**, since we are building a backhaul to an MT. However, for **partial migration the procedure cannot be UA** since the MT has migrated to CU2. Let’s discuss how to proceed. |
|  |  |  |
|  |  |  |
|  |  |  |

**Q2: BAP operation, whether to wait for RAN2 progress or not? If not, please indicate what RAN3 specific issues to address and proposals.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM |  | RAN2 should to the BAP internal processing. RAN3 should focus on overall procedure, configurations, and inter-CU signaling. |
| Samsung |  | For BAP operation, it is in RAN2 scope. Thus, the configuration for BAP related configurations at the boundary node side (e.g., header rewriting, routing, bearer mapping) can wait for RAN2 progress. However, as commented QC, RAN3 can work on the overall procedure, inter-CU signaling.  |
| Lenovo |  | BAP operation has been discussed by RAN2. We may no need to discuss the same issues in RAN3.And agree with QC to focus on overall procedure, configurations, and inter-CU signaling in RAN3. |
| CATT | Yes  | Currently, we do not see any RAN3 specific impact |
| Huawei | Yes | We think we should wait for RAN2 to conclude this, it is in RAN2 scope. |
| **Fujitsu** | **Yes** | Need to wait for RAN2 for decisions on the BAP operation. |
| ZTE | Yes  | RAN2 is discussing BAP operation. RAN3 does not need to do repetitive work. |
| Nokia | Yes | BAP is in RAN2 scope. So need to wait for RAN2. |
| **Ericsson** | Wait | Last time we took decisions that are owned by RAN2, in fact. |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

### Handling of concatenated traffic

**Q3: For concatenated traffic, whether to agree that the F1-terminating CU divides E2E QoS requirement into two parts: provided by its own topology fragment, provided by the non-F1-terminating CU’s topology fragment which is informed by F1-terminating CU.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM |  | The term “concatenated traffic” has not been used in RAN3, and it has not been agreed in RAN2 either. We may want to use the term “inter-topology descendent node” traffic. On Q3: This is up to implementation of CU1. |
| Samsung  |  | We understand that “concatenated traffic” means the traffic needs to be transferred via two topologies. With this understanding, the E2E QoS requirement should be divided. However, we are unclear if there are any specification impact. |
| Lenovo |  | Firstly, it’s hard for the F1-terminating CU to divide the E2E QoS requirement into two fragments accurately unless the F1-terminating CU has all topology information of the non-F1-terminating CU’s, And F1-terminating CU and non-F1-terminating CU can perform routing and bearer mapping well with the E2E QoS requirement in their own topology fragment. |
| Huawei | Yes | We think it should divided, then it is up to the stage 3 signalling design, which may or may not have direct spec impacts. |
| **Fujitsu** | Maybe no | This seems to be an optimization. Not sure it is useful to provide this kind of QoS fragmentation given that most topics on fairness, latency, congestions are de-prioritized in RAN2.Further, this can be CU implementation issue. |
| ZTE |  | This is reasonable, and can be up to implementation of F1-terminating CU. |
| Nokia |  | This may be true, but this is up to the F1-Terminating CU’s implementation, e.g. to transfer the specific QoS values to non-F1-Terminating CU. |
| **Ericsson** | **Yes? Look right** | CU1 should tell to CU2 the PDB of the source path between CU1 and boundary node. The reason is that the node may be at a different distance (in wireless hops) from CU2 than it was from CU1. The issue pertains to partial migration as well. If that is the meaning, then we agree. |
|  |  |  |
|  |  |  |

**Q4: For downstream concatenated traffic, whether to agree that the informed QoS requirement info are associated with one egress routing ID and one egress BH RLC CH at the boundary node; the non-F1-terminating CU feedbacks one or multiple ingress routing ID(s) associated with each egress routing ID, and one or multiple ingress BH RLC CH(s) associated with each egress BH RLC**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM |  | For DL, each QoS info passed to CU2 should be associated with a DL mapping used in Top1 before the migration, since the DL mapping = {BAP routing ID, BH RLC CH} represents the finest granularity of QoS.CU2 needs to create the Top2 DL mappings in a manner that avoids 1:N mapping for BAP routing ID as well as 1:N mapping for BH RLC CH at the boundary node. For this purpose, CU2 should know which QoS infos share the same BAP routing IDs or BH RLC CHs in Top 1. **CU1 should therefore include the BAP routing ID and top-1egress BH RLC CH at the boundary node with the QoS Info.**CU2 should return the (BAP routing ID, top2-ingress BH RLC CH at the boundary node) for each QoS info it receives. |
| Samsung  |  | We understand that the inter-CU signaling should ensure that the configurations at the CU2 side will not cause the 1:N mapping w.r.t. BAP routing ID/BH RLC CH. There are two ways:* Way 1: ensured by CU1

e.g., the provide QoS info. corresponds to the traffic with the same BAP routing ID and same egress BH RLC CH. By this way, the CU1 does not need provide any information related to BAP routing ID and egress BH RLC CH. The only additional information is to provide the DL IP address(es) for the traffic. After receiving this information, the CU2 can freely configure the target path for DL since 1:N mapping will never happen, and ensure the traffic is mapped to the same BAP routing ID and egress BH RLC CH for UL. In particular, the inter-CU signaling is:From CU1 to CU2:* + QoS info. of traffic with the same BAP routing ID and same egress BH RLC CH
	+ A list of DL destination IP address(es) of the traffic

From CU2 to CU1* + Accepted QoS info.
	+ DL traffic: DSCP/FL setting for each IP addr., ingress BH RLC CH, prior-hop BAP address, ingress BAP routing ID
* Way 2: ensured by CU2

It seems this is aligned with QC’s proposal. We are open for discussion. However, we feel Way 1 would be an easy implementation since 1) not too much information should be provided by CU1, 2) CU2 just configures its target path freely. So, we prefer to start from **way 1 with the following information exchange as the starting point (which provide the smallest set of information to be provided by CU1)**: **From CU1 to CU2:*** + **QoS info. of traffic with the same BAP routing ID and same egress BH RLC CH**
	+ **A list of DL destination IP address(es) of the traffic**

**From CU2 to CU1*** + **Accepted QoS info.**
	+ **DL traffic: DSCP/FL setting for each IP addr., ingress BH RLC CH, prior-hop BAP address, ingress BAP routing ID**
 |
| Lenovo |  | The definition of concatenated traffic is not clear here. We may replace it with “UP BH traffic to the boundary node” corresponding to “UP access traffic to the boundary node” agreed in last meeting.Anyway, we agree with the BH RLC CH granularity and routing ID granularity when passing QoS info over Xn interface for UP BH traffic to the boundary node. |
| CATT | See comments | For DL, F1-terminating donor sends QoS associated with BAP routing ID and ingress BH RLC channel to identify different F1-U. Note that the F1-U with same BAP routing ID may have different ingress BH RLC and egress BH RLC hence we need BH RLC channel information. Mapping at boundary node based on the BAP header rewrite related information, which has a table (BAP routing ID in topo2, ingress BH RLC in topo2, prior hop in topo2)🡪( BAP routing ID in topo1, egress BH RLC in topo 1, next hop in topo1). In order to configure this table, non F1 terminated node should provide BAP routing ID in topo2, egress BH RLC in topo 2 to F1 terminated nodeNon-F1-terminating CU feedbacks DSCP/flow label. In general, F1-terminating donor sends QoS associated with BAP routing ID and ingress BH RLC channel; Non-F1-terminating CU feedbacks DSCP/flow label+ (BAP routing ID in topo2, egress BH RLC in topo 2) |
| Huawei  | Yes | As both QC and SS commented, the intention is to avoid 1:N mapping. With this intention, we think anyway we could try to agree some basic info to be exchanged, i.e.:CU1->CU2:* QoS requirement info associated with one egress routing ID and one egress BH RLC CH

CU2->CU1* one or multiple ingress routing ID(s) associated with each egress routing ID, and one or multiple ingress BH RLC CH(s) associated with each egress BH RLC
* Accepted QoS info

We could leave the rest for concrete signaling design |
| **Fujitsu** |  | A simplified description would be:CU1->CU2:* QoS requirement info associated with one or a bundle of F1-Us, one egress routing ID and one egress BH RLC CH

CU2->CU1* ingress routing ID associated with the egress routing ID, and ingress BH RLC CH ID associated with the egress BH RLC
 |
| ZTE |  | In our view,CU1->CU2:* QoS info associated with one egress BH RLC channel, and one or multiple egress routing ID(s) associated with the egress BH RLC CH

CU2->CU1* One or multiple ingress routing ID(s) associated with each egress routing ID, and one or multiple ingress BH RLC CH(s) associated with each egress BH RLC

For IP address, it depends on who determines the IP address of migrated traffic, e.g. F1-terminating donor, non-F1-terminating donor or boundary node/descendant node.  |
| Nokia |  | Two types of information need to be exchanged between CU1 and CU2: \* for BAP header re-writing: ingress/egress routing ID, etc, needs to wait for RAN2 discussion.  \* for BH RLC CH mapping: CU need to ensure the configured traffic mapping not cause 1:N issue. As Samsung commented, there are 2 ways. Both works, but it may be better to let CU2 to freely configure the mapping in CU2’s topology. CU1 -> CU2: QoS info for each traffic (e.g. F1-C, or F1-U tunnel)CU2 -> CU1: for each traffic, the DL DSCP/IPv6 FL, established BH RLC CH ID in CU2’s topology |
| **Ericsson** |  | For now, let us agree on the following:**From CU1 to CU2, for DL:*** **For each egress BAP routing ID** subject to offloading (NOTE: CU1 need not provide the BAP routing IDs explicitly, an index would be sufficient):
* **Index of egress BAP routing ID**.
* The corresponding Q**oS of egress BH RLC channel. carrying it** in Top1
* **Index of this egress BH RLC CH**.
* An **indication of the traffic load** to be offloaded.

Based on this information, the target can decide how to group the ingress BAP routing IDs into ingress BH RLC channels. **From CU2 to CU1, for DL, for each egress BAP routing ID index received from CU1**:* **Ingress BAP routing ID** for Top2 (index received from CU1 should be included, to couple with the corresponding BAP routing ID from CU1).
* **Ingress BH RLC CH ID for the ingress BAP routing ID** (index received from CU1 should be included, to couple with the corresponding BH RLC CH ID from CU1).
* **Previous-hop BAP address.**

**Proposal: The same XnAP IE for inter-donor routing setup is used for all inter-donor routing scenarios.** |

**Q5: For uplink concatenated traffic, whether to agree that the informed QoS requirement info are associated with one ingress routing ID and one ingress BH RLC CH at the boundary node; the non-F1-terminating CU feedbacks one egress routing ID associated with each ingress routing ID, and one egress BH RLC associated with each ingress BH RLC CH**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM |  | For UL, each QoS info passed to CU2 should be associated with an uplink mapping used in Top1, since the UL mapping = {BAP routing ID, BH RLC CH} represents the finest granularity of QoS.To ensure that 1:N mapping is avoided, **CU1 should include the BAP routing ID and top-1ingress BH RLC CH at the boundary node with the QoS Info.**CU2 should return (BAP routing ID, top2-egress BH RLC CH at the boundary node) for each QoS info it receives. |
| Samsung  |  | As commented for DL, we think Way 1 requires the smallest info, which only include the QoS info. of the traffic associated the same BAP routing ID and ingress BH RLC CH.**From CU1 to CU2:*** + **QoS info. of traffic with the same BAP routing ID and same ingress BH RLC CH**

**From CU2 to CU1*** + **Accepted QoS info.**
	+ **UL traffic: egress BH RLC CH, next-hop BAP address, egress BAP routing ID**

Meanwhile, for the information from CU1 to CU2, it may not need to differentiate DL and UL.  |
| Lenovo |  | Same to Q4. |
| CATT |  | For UL, boundary decides whether to perform reroute i.e., transmission on target path. It is transparent for descendant node. If reroute is needed, it based on the BAP header rewrite related information which has a table about (BAP routing ID in topo1, ingress BH RLC in topo1, prior hop in topo1)🡪 ( BAP routing ID in topo2, egress BH RLC in topo 2, next hop in topo2). In order to configure this table, non F1 terminated node should provide BAP routing ID in topo2, egress BH RLC in topo 2 to F1 terminated node.In general, F1-terminating donor sends QoS associated with BAP routing ID and ingress BH RLC channel; Non-F1-terminating CU feedbacks DSCP/flow label+ (BAP routing ID in topo2, egress BH RLC in topo 2) |
| Huawei | Yes | Similar comments as above, we could try to agree some basic info to be exchanged, as suggested in the question. |
| **Fujitsu** |  | Similar to downstream, a simplified description would be:CU1->CU2:* QoS requirement info associated with one or a bundle of F1-Us, one ingress routing ID and one ingress BH RLC CH

CU2->CU1* egress routing ID associated with the ingress routing ID, and egress BH RLC CH ID associated with the ingress BH RLC
 |
| ZTE |  | CU1->CU2:* QoS info associated with one ingress BH RLC channel, and one or multiple ingress routing ID(s) associated with the ingress BH RLC CH

CU2->CU1* Each egress routing ID associated with one or multiple ingress routing ID(s), and one or multiple ingress BH RLC CH(s) associated with each egress BH RLC
 |
| Nokia |  | Similar as comment on Q4Two types of information need to be exchanged between CU1 and CU2: \* for BAP header re-writing: ingress/egress routing ID, etc, needs to wait for RAN2 discussion.  \* for BH RLC CH mapping: CU need to ensure the configured traffic mapping not cause 1:N issue. As Samsung commented, there are 2 ways. Both works, but it may be better to let CU2 to freely configure the mapping in CU2’s topology. CU1 -> CU2: QoS info for each traffic (e.g. F1-C, or F1-U tunnel)CU2 -> CU1: for each traffic, established BH RLC CH ID in CU2’s topology, UL Routing ID  |
| **Ericsson** |  | For now, let us agree on the following:**From CU1 to CU2, for UL:*** **For each ingress BAP routing ID** subject to offloading (NOTE: CU1 need not provide the BAP routing IDs explicitly, an index would be sufficient):
* **Index of ingress BAP routing ID**.
* The corresponding **QoS of ingress BH RLC channel. carrying it** in Top1
* **Index of this ingress BH RLC CH**.
* An **indication of the traffic load** to be offloaded.

Based on this information, the target can decide how to group the egress BAP routing IDs into egress BH RLC channels. **From CU2 to CU1, for UL, for each ingress BAP routing ID index received from CU1**:* **Egress BAP routing ID** for Top2 (index received from CU1 should be included, to couple with the corresponding BAP routing ID from CU1).
* **Egress BH RLC CH ID for the egress BAP routing ID** (index received from CU1 should be included, to couple with the corresponding BH RLC CH ID from CU1).
* **Previous-hop BAP address.**

**Proposal: The same XnAP IE for inter-donor routing setup are used for all inter-donor routing scenarios.** |

**Q5.bis: If non-F1-terminating CU is not able to guarantee the per topology fragment QoS requirement by configuring less or equal egress routing ID/BH RLC CH than the ingress ones, whether it should reject the request from F1-terminating CU.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM | Yes |  Fine with us. |
| Samsung  | Yes  |  |
| Lenovo |  | That's not going to happen because we have sufficient space for routing ID and BH RLC CH. |
| CATT | Maybe no | We consider partial accept for both UL and DL. If we do not allow 1:N mapping, the non-F1-terminating CU can accept some of QoS if non-F1-terminating CU cannot meet the all the QoS from F1-terminating CU |
| Huawei  | Yes |  |
| **Fujitsu** | **Yes** | There should be a possibility for non-F1-terminating CU to reject the request from F1-terminating CU. However, the reason may not be less or equal egress routing ID/BH RLC CH than ingress ones. It may be the QoS requirement cannot be satisfied by existing egress routing ID/BH RLC CH, no resource for more egress routing ID/BH RLC CH, etc. |
| ZTE | Yes  |  |
| Nokia | See comments | Please clarify “**not able to guarantee the per topology fragment QoS requirement by configuring less or equal egress routing ID/BH RLC CH than the ingress ones**”Does it mean the QoS cannot be guaranteed, or no space for routing ID?The required QoS may not be guaranteed, CU2 can return the failed F1-U tunnel to CU1. So reject is possible. |
| **Ericsson** | Yes |  |
|  |  |  |

**Q6: What is the granularity of the informed QoS requirement info, “per GTP-U tunnel”, “per group of GTP-U tunnels” or BAP routing ID, and it is up to F1-terminating CU’s implementation?**

|  |  |  |
| --- | --- | --- |
| **Company** | **“per GTP-U tunnel”, “per group of GTP-U tunnels” or BAP routing ID** | **Comments if any** |
| QCOM | See comment | Again, use same reporting mechanism for descendent node traffic as for boundary node traffic, i.e., per one or bundle of F1-U tunnels.  |
| Samsung  |  | Per one or bundle of F1-U tunnels, which is up to F1-terminating CU’s decision.  |
| Lenovo |  | For the UP BH traffic to the boundary node, we prefer the BH RLC CH granularity and routing ID granularity for cross topology bearer mapping and routing respectively.Granularity with per GTP-U tunnel may introduce too much overhead and doesn’t see strong benefit than per BH RLC CH granularity and per routing ID granularity. |
| CATT  | Per one or multiple F1-U GTP-U tunnels. | Same as F1 terminated at boundary node |
| Huawei | **“per GTP-U tunnel”, “per group of GTP-U tunnels”** | We also agree it should be up to 1-terminating CU’s decision. |
| **Fujitsu** | Per GTP-U tunnel, per group of GTP-U tunnels | To align with RAN3#113e agreement for access traffic:2c: For UP access traffic to the boundary node, QoS info to be passed over the Xn interface with granularity of one or multiple F1-U GTP-U tunnels. |
| ZTE | Per GTP-U tunnel, per group of GTP-U tunnels | Disagree with BAP routing ID granularity.The UL F1-U tunnels may be routed via the same path in topology 1. So they have the same BAP routing ID, but they may have different QoS requirements. |
| Nokia | Per group of GTP-U tunnels | “per GTP-U tunnel” can be covered by “per group of GTP-U tunnels” when this group only contain one GTP-U tunnel. |
| **Ericsson** | Per GTP-U tunnel or a group thereof | Nokia’s version sounds even more elegant |
|  |  |  |

**Q7: What are the information about non-F1-U traffic, to be exchanged between the F1-termination donor and non-F1-termination donor?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM |  | For descendent node traffic, the same info should be exchanged as for the boundary node traffic., which is traffic-type granularity. |
| Samsung  |  | Non-F1-U traffic type (e.g., F1-C, non-F1, both), and for DL, the IP address list should be provided |
| Lenovo |  | DL egress and UL ingress BH RLC CH/routing ID for each non-F1-U traffic type can be provided via Xn. |
| CATT |  | F1-termination donor to non-F1-termination Non UP traffic type, BAP routing ID, ingress BH RLCnon-F1-termination donor to F1-termination donorDSCP/ flow label for DL, (BAP routing ID in topo2, egress BH RLC in topo 2) |
| Huawei |  | Agree with SS |
| **Fujitsu** |  | Non-UP traffic type. Other information may be common for non-F1-U and F1-U traffic, such as ingress/egress BAP routing ID, BH RLC CH, TNL address of boundary node and/or descendant nodes. |
| ZTE |  | Non-UP traffic type, ingress/egress routing ID and ingress/egress BH RLC CH. |
| Nokia | Yes | Similar to F1-U, with the difference to use non-F1-U traffic type instead of F1-U tunnel(s) |
| **Ericsson** |  | Two things:* Non-UP traffic type
* Control plane traffic type
 |

## CP/UP separation

Here moderator would suggest that the discussion focus on the information related with F1-U and non F1-U traffic.

### Configuration of F1-U and non F1-U traffic

**Q8: Whether to add Add “IAB Node Indication” to set up dual-donors DC for the IAB node?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM | Yes | We also have this for ENDC. |
| Samsung  | Yes  |  |
| Lenovo | Yes |  |
| CATT | Maybe yes for scenario 1 | For scenario 1, SN (IAB donor) should configure the BAP related configuration to IAB node.While, for scenario 2, SN may not need to know this is a IAB node access. It only send the RRC message to this DC node |
| **Huawei**  | Yes |  |
| **Fujitsu** | **Yes** |  |
| ZTE | Yes  |  |
| Nokia | Yes |  |
| **Ericsson** | Only for Scenario 1 |  |

**Q9-1: Whether the IAB-node can be configured with the CG to be used to transmit F1-C, i.e., via f1c-TransferPath-r17 {mcg, scg, both}?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM | Yes | We should have the same behavior as for Rel-16 IAB in ENDC.  |
| Samsung  |  | {mcg, scg, both} is fine to us. Also, to be future proof, we can configure this by indicating the cell group ID if multi-connectivity is supported in the future. BTW, this is also discussed in RAN2, shall we wait for RAN2 progress? |
| Lenovo | Yes | But this can be discussed by RAN2. |
| CATT | Yes |  |
| Huawei  | Yes |  |
| **Fujitsu** | **Yes** |  |
| ZTE | Yes  |  |
| Nokia | Yes |  |
| **Ericsson** | RAN2 scope |  |

**Moderator’s note: ff the answer is Yes to Q9-1, companies are invited to provide further comments to the following question Q9-2, Q9-3, Q-4.**

**Q9-2: Whether to agree the following proposal, if the answer is Yes to Q9-1?**

* **If “*both*” is configured, whether to agree that it is IAB-node’s implementation to choose the CG for F1-C?**
* **If the indicated/selected CG for F1-C includes default BH RLC, IAB-node uses “F1-C over BAP”. Otherwise, IAB-node uses “F1-C over RRC”.**
* **If the CG for F1-C is not configured, IAB-node chooses the CG including default BH RLC and uses “F1-C over BAP”, i.e., the default CG.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM | See comment | First bullet: Yes, if both are configured, it is up to implementation which of the two the IAB-node uses.Second bullet needs clarification: if BAP is available for the CG then BAP should be used. We don’t have to get into the details if there must a default BH RLC CH or not, because it may ride us into some corner cases.Third bullet: This is not clear. It sounds like an erroneous configuration. |
| Samsung  |  | Shall we wait for RAN2 progress? |
| Lenovo |  | This can be discussed by RAN2. |
| CATT | 1. yes;2. Yes;3. no  | 3. If a CG for F1-C is not configured, IAB node choose another CG for F1-C, it should be F1-C over RRC. Otherwise, CP-UP separation cannot be supported |
| Huawei | Yes | In general we also share QC’s understanding, for 2) and 3), the intention is to say that if BAP is available for the CG then BAP should be used, if nothing configured for F1-C, we should use the default CG. |
| **Fujitsu** |  | Can wait for RAN2 decision. |
| ZTE |  | This should be discussed by RAN2. |
| Nokia | Yes | This needs to be discussed/confirmed by RAN2. |
| **Ericsson** | RAN2 scope | Even though we are talking about carrying F1-C traffic, which is RAN3 domain, the means for carrying it (CG) is up to RAN2. |

**Q10: introduce an explicit request for MN to indicate to SN its intention to send F1-C traffic over SRB.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM | Not | We discussed this already last meeting. MN requests split-SRB from SN. SN can reject. We don’t need to duplicate this for every reason under the sun that might exist to use split-SRB. |
| Samsung  | Yes  | If Split-SRB is rejected by SN without knowing this reason, the F1-C via SN is impossible, which means that we will face a case the CP-UP separation is not supported.  |
| Lenovo | Yes | Agree with Samsung. |
| CATT | No  | Whether to establish a split SRB depends on SN’s decision. SN cannot establish a split SRB2 which is likely related to resource and capacity constraints. Hence even providing some cause value to SN, it may not change SN's decision. Note that there is no cause value can affect the split SRB establishment in the current specification. It is propose to follow the current principle. |
| Huawei  | Not sure | Similar comments as QC |
| **Fujitsu** |  | No strong view. |
| ZTE |  | Agree with SS’s comment. However, an explicit indication may not be needed. Because SN can implicitly know to setup split SRB, such as via IAB node indication or IAB-MT capability information (e.g. F1-C over RRC).  |
| Nokia | Yes |  |
| **Ericsson** | No | This issue was concluded last time. Nothing new is needed. |

**Q11: whether a node broadcasting “IAB-support” just supports the IAB-functionality of a “non-donor CU for CP-UP separation” but not full donor capability, or it is just node implementation?**

The issue is mainly about whether a node broadcasting “IAB-support” may not be able to act as a full capability IAB node but just could forward F1-C over RRC towards another neighbor node when performing CP/UP separation, i.e. support the IAB-functionality of a “non-donor CU for CP-UP separation” but not full donor capability, or it is just node implementation.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM |  | We discussed this last time. There should only be two levels of IAB support on CU:1. CU supports IAB. This means it transmits IAB-supported over SIB and it can, but need not, assume donor functionality.2. CU does not support IAB. Period. |
| Samsung  |  | In our understanding, if IAB-support is broadcast, the node can be either donor CU with full IAB functionality, or a node being able to find a donor CU with full IAB functionality. |
| CATT | No | If a node broadcast IAB support, it means that this node has full donor capability but just not act as a donor for this IAB node. It is no need to design a third type of donor. The benefit is not clear. |
| Huawei |  | We would like to make things clear, we think it should be CU’s implementation to choose whether act as a full capability of IAB support or just find another CU with full IAB functionality. |
| **Fujitsu** | No | No need to introduce a third type of donor node. |
| **ZTE** |  | Agree with Samsung. |
| Nokia |  | Agree with QCOM |
| **Ericsson** | No | IAB support is binary: either Yes or No. |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## Others

**Q12: where any enhancements needed to support revoking mechanism? If yes, please also share further understandings of potential enhancements.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments if any** |
| QCOM |  | Discussed in CB 1302 |
| CATT | Yes  | Source CU should inform target CU to release or suspend the configuration for F1 transmission on target path after revoking. Only the source CU and boundary node know the revoke procedure is finished rather than target CU. Note that it is not UE context release message because there is no UE context in target CU.  |
| Huawei | Maybe not | But we are ok to let CB 1302 to make the final decision |
| Fujitsu | Yes | We think there is need for revocation of part or all of the offloaded redundant paths. Note that in R16 we have the release of the redundant path for intra-CU topology redundancy. For inter-CU case, this may use a new XnAP procedure. This can be discussed together with CB#1302. |
| ZTE | No | To my understanding, the revocation in redundancy means the traffic is migrated back to the MCG link. This can be achieved through existing procedure.  |
| Nokia |  | Covered by CB1302 |
| **Ericsson** | Yes  | We can discuss it here or in CB on TopAdapt.Moreover, in inter-donor topology redundancy, it should be possible to do partial revoking i.e. return to source path a part of offloaded traffic.**Proposal: In inter-donor topology redundancy, it should be possible to do partial revoking i.e., return to source path a part of offloaded traffic.** |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Q13: Any other issues related to the, but not covered by?**

|  |  |
| --- | --- |
| **Company** | **Comment** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

# References

[1] R3-214824, Inter-Donor Routing in IAB Topology Redundancy Scenarios (Ericsson)

[2] R3-214875, (TP to BL CR of TS38.423) Discussion on inter-donor topology redundancy (Samsung)

[3] R3-214926, Discussion on inter-donor topology redundancy (ZTE)

[4] R3-214955, Inter-donor topology transport (Qualcomm Incorporated)

[5] R3-215015, Discussion on inter-CU topology redundancy (CATT)

[6] R3-215304, Discussion on IAB inter-donor topology redundancy (Lenovo, Motorola Mobility)

[7] R3-215611, Inter-CU topology redundancy (Huawei)

[8] R3-215346, discussion on Inter-Donor IAB Topology Redundancy (Nokia, Nokia Shanghai Bell)